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FOR:	PAGE INFORMATION DISPLAY METHOD AND DEVICE AND STORAGE MEDIUM STORING PROGRAM FOR DISPLAYING PAGE INFORMATION
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PAGE INFORMATION DISPLAY METHOD AND DEVICE AND STORAGE MEDIUM STORING PROGRAM FOR DISPLAYING PAGE INFORMATION

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a page information display method and device, and in particular to a page information display method and device for displaying electronic information in a unit of page of predetermined size.

Description of the Prior Art

10   Conventionally, the information required for the work, study or life is provided from the origins of information to the reader, using media such as books, or periodical publications, e.g., newspaper or magazines or the like. Also, the administrative or judicial information is

15   provided in publications or documents.

In recent years, the Internet (Inter Network) by a TCP/IP has been well prepared to enable computers for the government, company, college, and individual to be interconnected directly or via a telephone network. With

5   the development of providing the information via the Internet, a variety of information is created as an ML page (e.g., HTML page or XML page) created on the basis of a makeup language, which allows this page (typically referred to as a home page) to be accessed by using a

10   computer. To provide the ML page, a large amount of documents are created in a PDF format, and can be downloaded from respective home pages. Just as a patent gazette is provided in CD-ROM, the important information may be publicized or circulated in the computer readable medium

15   other than the Internet.

     The information provided in a format accessible using a computer may include information contents from a wide variety of information sources covering data sheets of products manufactured by the company, the information of

new products, documents created by the administration,

pieces of legislation in making, the Supreme Court gists,

research results of the college laboratory, detailed

information of lodgings in a certain region, news, weather

5   forecasts, for example. These may be duplicately provided

in other paper media such as newspaper columns, magazines,

or catalogues, but simply provided through the Internet

or in the computer readable medium. Most of the past

information may be often difficult to obtain substantially

10   in paper media.

As the information infrastructures such as the

Internet are prepared throughout the world in the future,

more informatization will penetrate into the society

increasingly. Thereby, it is apprehended that there

15   occurs a personal difference in the amount or quality of

necessary information between the user familiar with the

computer and the user unfamiliar with the computer.

Means for operating the computer may be a graphical

user interface (GUI, hereinafter referred to as a desktop

metaphor) useful in most cases, which is metaphoric to the

working environment of desk in the actual world. Through

the user interface in the desktop metaphor, the working

environment of desk is comically drawn to allow a file

5   structure specific to the computer which is nonobjective

and uneasy to understand to correspond with something

present in the working environment of desk such as a file

or folder. Thus, the computer beginners can operate the

computer intuitively. For example, to delete a file, the

10   file indicated by an icon which is metaphoric to paper is

dragged and dropped into a garbage box.

However, through use of the user interface of desktop

metaphor, many people in the world may think that the simple

operation of gaining access to the electronic information

15   in the computer is difficult. That is, through the user

interface of desktop metaphor, it is required to make access

to the electronic information by instructing or operating

indirectly a virtual device such as buttons drawn on the

display of computer, a pop-up menu, or a slide bar, using

an input device such as a mouse or keyboard peculiar to

the computer.

BRIEF SUMMARY OF THE INVENTION

5 Object of the Invention

In the conventional examples as described above, there

was a drawback that the access of information through the

use of a computer was difficult. The operation scheme

specific to the computer may take considerable time to

10 master the operation. Thus, everyone can not easily make

use of electronic information provided by the computer.

Accordingly, there is a personal difference in the quality

and amount of information available between the users. If

many people feel it difficult to use the computer, the

15 information provider abolishes the paper media for the

information necessary to be conveyed and cannot entirely

transfer to the electronic information.

For example, it was reported that when a large company

introduced a computer system to do all business contacts

and settlements of accounts by abolishing the paper media,

the preparatory period was set to two years, and one year

or more was dedicated to an education period for new staff

members to get accustomed to the computer, so that the

5   company fully succeeded in computerization. Some colleges

provide computer literacy courses to educate the basic

usage of computer. Generally, in the study and training

of new staff members in the companies or government offices,

the computer operation is educated. They are taught about

10   not only access of the information, but also input and

origination of the information. However, for the people

who never have used the computer at all, it is a difficult

work to simply access the information.

Therefore, it is desirable to provide a user interface

15   which is intuitive and easy to operate, rather than a

desktop metaphor. Particularly, an information access

device which has a simple appearance and enables the

operation intended to access the electronic information

is promising.

To cope with such a problem, a prior access device which

is an improved desktop metaphor was disclosed in Japanese

Patent Laid-Open No. 5-165595. This realizes the

appearance of a book on the display unit, and relies on

5   a method of visualizing the electronic information on the

display unit by outputting the overlapped pages composed

of a plurality of sentences dislocated slightly to the

display unit. A heading symbolizing a set of sentences is

appended with the content of sentences as a unit of set

10   to improve the desktop metaphor. However, in this

conventional example, the amount of information to be

displayed increases in proportion to an increase in the

number of pages. Therefore, it is often difficult to

secure the display area sufficiently. Consequently, there

15   is a problem that the access area is reduced to make the

access difficult.

A CRT or a liquid crystal display is becoming higher

in resolution year after year. For example, if the

resolution of about 150dpi in A4 size is realized, it is

possible to access the whole one face of newspaper in A4

size. That is, if the display has substantially a

resolution of facsimile class, the newspaper or magazine

is made readable in a size which is smaller than the actual

5   size. In such a high-resolution display, the display of

1200 × 1600 dots can be made in A4 actual size. Therefore,

the physical size becomes too small to be useful for the

icon in the conventional operating system, giving an

impression of something intricate to the user, possibly

10   resulting in a user interface which is rather uneasy to

understand.

Therefore, the development of a user interface in the

next generation which can be intuitively used by the

computer beginners as well is required. Then, it is

15   desired to adopt a high-resolution display without

changing the operation. In other words, it is desired to

develop the user interface which is easy to master the

operation and not dependent on the resolution.

Object of the Invention

It is an object of the present invention to resolve

the inconveniences associated with the conventional

example, and to provide a user interface for enabling access

5 to the information which is easily understood by all people,

irrespective of the computer experiences.

Summary of the Invention

Therefore, the present invention adopts a user

10 interface having a metaphor like a book, newspaper or

magazine. To realize the metaphor of this book, the

electronic information is allowed to access in a unit of

page of predetermined size. That is, the electronic

information is displayed in a unit of page of predetermined

15 size in an information access area of a display unit. And

there is only a single information access area and the page

can not be turned physically, unlike books. But a user

interface which is metaphoric to the operation of turning

over pages enables the information access area to be

effectively used. This invention has a new feature in the

user interface metaphoric to the operation of turning over

pages, as will be detailed later.

Based on the above described analysis, and in order

5   to accomplish the aforementioned object, the present

invention provides a page information display method for

displaying the electronic information using an information

access device comprising a storage unit for storing the

electronic information having plural pages of information

10   in a unit of page of predetermined size, a display unit

for displaying the electronic information stored in the

storage unit in the unit of page, and an operation unit

for inputting an operation to gain access to the page

information, the operation unit being provided in the

15   substantially same area as the display unit, and the method

comprises: a page turning operation detecting step of

outputting a page turning operation detecting signal when

a dragging is made on the operation unit in parallel or

anti-parallel to a predefined page turning direction at

a current page read from the storage unit that is to be

displayed at present; a next display page setting step of

setting a preceding page or a succeeding page immediately

before or after the current page depending on a direction

5   of the dragging operation to a next display page to be

displayed at the next time, when the page turning operation

detecting signal is detected in the page turning operation

detecting step; and a page turning process step of

displaying the next display page set in the next display

10   page setting step in place of the current page on the display

unit.

The operation unit, which is provided in the

substantially same area as the display unit, corresponds

to a touch panel or a computer display, for example. When

15   a dragging is made in a page turning direction on this

operation unit, in other words, a dragging operation to

press a mouse button and hold it down while moving the

pointer in a page turning direction (or an opposite

direction), and release the mouse button is performed, a

page turning operation detecting signal is output in the

page turning operation detecting step. In the next display

page setting step, a preceding page or a succeeding page

of the current page is set as a next display page, depending

5   on a direction of dragging operation. If the next display

page is set, the next display page is displayed in place

of the current page on the display unit in the page turning

process step. In this way, when a dragging operation is

performed in parallel or anti-parallel to the page turning

10   direction, a page turning process is effected one page by

one page in accordance with the direction of that dragging

operation. Therefore, it is possible to turn over pages

of the electronic information with the same operation as

the motion of the user's hand.

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BRIEF DESCRIPTION OF THE DRAWINGS

This above-mentioned and other objects, features and

advantages of this invention will become more apparent by

reference to the following detailed description of the

invention taken in conjunction with the accompanying

drawings, wherein:

FIG. 1 is a flowchart illustrating one example of a

page information display method according to a first

5   embodiment of the present invention;

FIG. 2 is a block diagram illustrating one example of

a page information display device in the first embodiment

as shown in FIG. 1, wherein FIG. 2A is a diagram showing

an overall configuration, and FIG. 2B is a diagram showing

10   a detailed configuration of a display controller;

FIG. 3 is an explanatory view illustrating an example

of a page turning operation with the configuration as shown

in FIGS. 1 and 2;

FIG. 4 is a flowchart showing a configuration of a page

15   holding operation according to the second embodiment of

the invention;

FIG. 5 is an explanatory view illustrating an example

of displaying the number of holding pages with the

configuration as shown in FIG. 4, wherein FIG. 5A is a view

illustrating a pressure circle, FIG. 5B is a view

illustrating a time circle, FIG. 5C is a view illustrating

a pressure/time operation performed in a predetermined

region, and FIG. 5D is a view illustrating an example of

5   displaying the pressure circle in accordance with the

operation as shown in FIG. 5C;

FIG. 6 is an explanatory view illustrating an

operation example in the second embodiment as shown in FIG.

4, wherein FIG. 6A is a view illustrating a configuration

10   of a page information display device, FIG. 6B is a view

illustrating an example of displaying the pressure circle;

FIGS. 7A, 7B and 7C are explanatory views illustrating

one example for displaying a multiloop with the

configuration as shown in FIG. 4;

15   FIG. 8 is an explanatory view illustrating an example

for displaying a coated circle with the configuration as

shown in FIG. 4, wherein FIG. 8A is a view illustrating

an example of the coated circle in a solid color, FIG. 8B

is a view illustrating an example of the coated circle

having transparency, and FIG. 8C is a view illustrating

an example of the coated circle having gradation;

FIG. 9 is an explanatory view illustrating another

example for displaying a coated circle with the

5   configuration as shown in FIG. 4, wherein FIG. 9A is a view

illustrating one example of the coated circle having a

distortion, FIG. 9B is a view showing the reference causing

the distortion, FIG. 9C is a view illustrating an example

of distortion in the instance of a medium pressure, and

10   FIG. 9D is a view illustrating an example of distortion

in the instance of a large pressure;

FIG. 10 is a flowchart illustrating an example of

selecting a display format according to a third embodiment

of the invention;

15   FIG. 11 is a block diagram illustrating a

configuration of a page information display device in the

third embodiment;

FIG. 12 is an explanatory view illustrating one

example of the display format at the time of turning a page

with the configuration as shown in FIG. 10, wherein FIG.

12A is a view illustrating one example of the display format

of an overwrite type, and FIG. 12B is a view illustrating

one example of the display format of a slide type;

5   FIG. 13 is an explanatory view illustrating another

example of the display format at the time of turning a page

with the configuration as shown in FIG. 10, wherein FIG.

13A is a view illustrating one example of the display format

of a compression type, and FIG. 13B is a view illustrating

10   one example of the display format of a 3D type;

FIG. 14 is a flowchart showing a configuration of a

page information display method according to one

embodiment of the invention;

FIG. 15 is a block diagram illustrating a

15   configuration of a page information display device

suitable for practicing each step as shown in FIG. 14;

FIG. 16 is an explanatory view illustrating one

example of an initial state of a tag display in this

embodiment;

FIG. 17 is an explanatory view illustrating a tag display example at the fourth page with the configuration as shown in FIG. 16;

FIG. 18 is an explanatory view for defining various technical terms for use in a fourth embodiment of the present invention;

FIG. 19 is a flowchart showing the configuration of a semantic display process in which the tag length is changed continuously in the fourth embodiment of the present invention;

FIG. 20 is an explanatory view illustrating an example of a semantic display in the configuration as shown in FIG. 19;

FIG. 21 is a table showing one example of the page information display data for use in the fourth embodiment, in which FIG. 21A is a table illustrating an example where the minimum reference length is defined by the number of dots, and FIG. 21B is a table illustrating an example where

the minimum reference length is defined by the physical

length;

FIG. 22 is a block diagram illustrating a

configuration of a page data display device in the fourth

5 embodiment;

FIG. 23 is a flowchart illustrating one example of a

process for determining the tag width and the tag length

using the data of data structure as shown in FIG. 21;

FIG. 24 is a flowchart illustrating one example of a

10 process for switching between a normal display and a

semantic display;

FIG. 25 is a flowchart illustrating an example of a

process for displaying a tag again after turning a page;

FIG. 26 is an explanatory view illustrating a display

15 example while turning a page with the configuration as

shown;

FIG. 27 is a flowchart illustrating one example of a

process for expanding the tag during the semantic display;

FIG. 28 is an explanatory view illustrating a display

example with the tags near a pointer expanded in the process

for expanding the tag as shown in FIG. 27;

FIG. 29 is an explanatory view illustrating one

5   example of a page turning display format using a tag,

wherein FIG. 29A is a view illustrating one example the

display format of tag integral type, and FIG. 29B is a view

illustrating one example of the display format of pages

integral type;

10   FIG. 30 is a flowchart illustrating one example of a

tag display control with a holding operation in the fourth

embodiment;

FIG. 31 is an explanatory view illustrating one

example of the tag display control as shown in FIG. 30;

15   FIG. 32 is an explanatory view illustrating one

example of a tag coloring process under the tag display

control as shown in FIG. 30;

FIG. 33 is an explanatory view illustrating one example of the tag coloring process in an opposite tag display area to that of FIG. 32;

FIG. 34 is a flowchart illustrating one example of the tag display in a process of turning plural pages collectively;

FIGS. 35A and 35B are explanatory views illustrating a tag display example in the process of turning plural pages collectively as shown in FIG. 34;

FIGS. 36A and 36B are explanatory views for highlighting the tag display in an information access area in the process of turning plural pages collectively as shown in FIG. 34;

FIG. 37 is an explanatory view illustrating a tag display example after completing the process of turning plural pages collectively;

FIG. 38 is an explanatory view illustrating an example in which a pressure circle is displayed over a tag, wherein FIG. 38A is a view illustrating an example of a left page

tag, FIG. 38B is a view illustrating an example of a right

page tag, and FIG. 38C is a view illustrating an example

in which the tag coloring and the tag pressure circle are

employed at the same time;

5   FIG. 39 is an explanatory view illustrating an example

in which a holding object page is changed depending on an

operation direction upon the tag, wherein FIG. 39A is a

view illustrating one example of holding a previous page,

and FIG. 39B is a view illustrating one example of holding

10   a succeeding page;

      FIG. 40 is a block diagram showing the configuration

of this example;

      FIG. 41 is a flowchart showing the former part of a

page information display process in the configuration as

15   shown in FIG. 40;

      FIG. 42 is a flowchart showing the latter part of the

page information display process continued from the

process of FIG. 41;

FIG. 43 is a flowchart illustrating a process for displaying in enlargement the article information in a first example of this invention;

FIG. 44 is an explanatory view illustrating a continuous enlargement operation by dragging plural articles;

FIG. 45 is an explanatory view illustrating one example of an article enlargement display with wire frame, wherein FIG. 45A is a view illustrating a display example at the time of an enlargement process, and FIG. 45B is a view illustrating one example of the enlarged article information;

FIG. 46 is an explanatory view illustrating one example of a process of embossing and enlarging the article information, wherein FIG. 46A is a view illustrating a state in which an article is shaded for embossing, FIG. 46B is a view illustrating a state in which a selected article is being enlarged, and FIG. 46C is a view illustrating a state after the enlargement process is completed;

FIG. 47 is an explanatory view illustrating one example of a tag display when the article information is enlarged;

FIG. 48 is a diagram illustrating one example of an article information table which lists in correspondence the page information and the article information;

FIG. 49 is a flowchart illustrating a process in a second example of the invention;

FIG. 50 is a diagram illustrating the relation between a pointer event and a page turning in the process as shown in FIG. 49;

FIG. 51 is an explanatory view illustrating one example of a process for selecting one of the page turning and the continuous display of article information in a locus of dragging, wherein FIG. 51A is a view illustrating the locus on the straight line, and FIG. 51B is a view illustrating the locus having a curve;

FIG. 52 is a flowchart illustrating an example of a prefetch process in a third example of the invention;

FIG. 53 is an explanatory view illustrating one example of turning plural pages collectively;

FIG. 54 is an explanatory view illustrating an example in which the page information of high resolution is memorized;

FIG. 55 is an explanatory view illustrating an example in which the page information and the article information are memorized separately;

FIG. 56 is a block diagram illustrating a configuration of a page information processing unit that converts the ML data in a fourth example of the invention;

FIG. 57 is an explanatory view illustrating one example of the link structure of an ML page, wherein FIG. 57A is a view illustrating one example of the link structure, and FIG. 57B is a view illustrating an example in which the link structure is transformed into a book structure;

FIG. 58 is an explanatory view illustrating another example of the link structure of the ML page;

FIG. 59 is an explanatory view illustrating a further

example of the link structure of the ML page;

FIG. 60 is a block diagram illustrating a

configuration of a page information display device for

5   controlling the tag display at the time of streaming in

a fifth example of the invention;

FIG. 61 is a view illustrating an example of

controlling the tag display in accordance with the amount

of downloaded data in the configuration as shown in FIG.

10   60, wherein FIG. 61A is a view illustrating an example of

displaying the tag for the page which has been completely

downloaded, and FIG. 61B is a view illustrating an example

of setting the tag for the page being downloaded to the

tag length in accordance with the downloaded volume;

15   FIG. 62 is a view illustrating an example of

controlling the tag display in accordance with the amount

of downloaded data in all pages in the configuration as

shown in FIG. 60, wherein FIG. 62A is a view illustrating

an example of normally displaying the page tag only, and

FIG. 62B is a view illustrating an example of normally displaying the page tag by the length of tag in accordance with the volume of one page that has been downloaded;

FIG. 63 is an explanatory view illustrating an example of handling the history information in a sixth example of the invention, wherein FIG. 63A is a view illustrating one example of the history information in which the commands for limited operations are memorized, and FIG. 63B is a view illustrating one example of the history information in which the commands for all operations are memorized;

FIG. 64 is a flowchart illustrating a page information display control process using the history information;

FIG. 65 is a perspective view illustrating a computer that is employed in this example;

FIG. 66 is an explanatory view illustrating a conventional user interface; and

FIG. 67 show another conventional user interface, in which FIG. 67A is an explanatory view showing the state

of selecting the sheet 1, and FIG. 67B is an explanatory

view showing the state of selecting the sheet 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

5   The preferred embodiments of the present invention

will be described below with reference to the drawings.

A first embodiment involves a process of turning one page,

a second embodiment involves a process of turning plural

pages collectively, and a third embodiment involves the

10   display format during the page turning process. A fourth

embodiment involves associating an operation using a tag

with an element in each of the above embodiments. The cases

where the page information has plural pages of information,

and the page information is downloaded from a server, will

15   be described later by way of example.

First embodiment

In the first embodiment, the intuitive operation is

allowed to facilitate the access to the electronic

information, and a page turning process is effected in

accordance with an operation on an operation unit such as a touch panel. At this time, a page turning direction is determined depending on an operation direction. FIG. 1 is a flowchart illustrating one example of a page information

5 display method according to the first embodiment of the invention. The page information display method of this embodiment displays the electronic information using an information access device comprising a storage unit (electronic information memory) 4 for storing the

10 electronic information having plural pages of information in a unit of page of predetermined size, a display unit 1 for displaying the electronic information stored in this storage unit in the unit of page, and an operation unit 1C for inputting an operation to gain access to the page

15 information, the operation unit being provided in the substantially same area as the display unit. In an example of using a touch panel as the display unit 1, the display unit 1 and the operation unit 1C are integrated.

Referring to FIG. 1, the page information display method comprises a page turning operation detecting step A1 of outputting a page turning operation detecting signal when a dragging is made on the operation unit in parallel or anti-parallel to a predefined page turning direction at a current page read from the storage unit 4 that is to be displayed at present, a next display page setting step A2 of setting a preceding page or a succeeding page immediately before or after the current page depending on a direction of the dragging operation to a next display page to be displayed at the next time, when the page turning operation detecting signal is detected in the page turning operation detecting step A1, and a page turning process step A3 of displaying the next display page set in the next display page setting step in place of the current page on the display unit 1.

The page turning operation detecting step A1 further comprises a page turning operation judging substep of judging, as the page turning operation, an operation

exceeding a minimum operation length in the page turning

direction within a predefined allowance region in a

direction orthogonal to the page turning direction. The

next display page setting step sets a page number that is

5   equal to the page number of the current page incremented

or decremented by one, depending on the direction of

dragging operation, to the next display page. And the page

turning process step A3 performs the page turning process

to make the next display page a new current page. That is,

10   by dragging a pointer in the page turning direction on the

operation unit 1C, the next page is displayed. In the case

where the pointer is dragged in a direction anti-parallel

to the page turning direction, the previous page is

displayed. The pointer may be a pointing device of the

15   mouse, or a fingertip of the user. In the case where the

touch panel 1 is employed to perform the page turning

operation, the page turning operation is allowed in a

broader area than selecting the area where the tag is

displayed.

The page turning process involves deleting the current page from the display unit 1, and displaying the next display page on the display unit 1. To present the state of turning a page to the user more intuitively by effecting

5 this page turning process at stages, the current page may be gradually reduced, and the next display page may be displayed on the display unit at stages (refer to the third embodiment). Then, the page turning operation detecting step A4 may further comprise an operation rate calculating

10 substep of calculating a page turning rate that is a speed of the page turning operation, and the page turning process step A3 may further comprise a display rate setting substep of setting a display rate corresponding to the page turning rate calculated in the operation rate calculating step to

15 change the display from the current page to the next display page. Consequently, the relation between the page turning operation and the page turning process can be informed to the user more clearly.

FIG. 2 is a block diagram illustrating one example of a page information display device in the first embodiment as shown in FIG. 1, wherein FIG. 2A is a diagram showing the overall configuration, and FIG. 2B is a diagram showing the detailed configuration of a display controller. The page information display device of this embodiment has an electronic information memory 4 for memorizing the electronic information having plural pages of information in a unit of page of predetermined size, a touch panel 1 for displaying the electronic information stored in this electronic information memory 4 in the unit of page, as well as inputting an operation to gain access to the page information, and a display controller 3 for controlling the display of the page information stored in the electronic information memory 4 on the basis of an operation content input into this touch panel 1.

And the display controller 3 comprises a page turning operation detecting portion 60 for outputting a page turning operation detecting signal when a dragging is made

on the touch panel 1 in parallel or anti-parallel to a predetermined page turning direction 34 at a current page read from the electronic information memory that is to be displayed at present, a next display page setting portion

5   61 for setting a preceding page or a succeeding page immediately before or after the current page depending on a direction of the dragging operation to a next display page to be displayed at the next time, when the page turning operation detecting signal is output by the page turning

10   operation detecting portion 60, and a page turning process portion 62 for displaying the next display page set in the next display page setting portion 61 in place of the current page on the touch panel. The process of FIG. 1 can be implemented under the control of the display controller

15   3 having the above portions.

    FIG. 3 is an explanatory view illustrating one example of the page turning operation with the configuration as shown in FIGS. 1 and 2. As shown in FIG. 3, the page information having a one-dimensional structure (book

structure) is accessed by turning pages sequentially,

whereby the user unfamiliar with the computer operation

can acquire the necessary information surely.

The process contents of FIGS. 1 and 2 can be realized

5   by a page information display program that is executed under

the control of the display controller. In this case, the

page information display program has the commands

corresponding to the configuration as shown in FIGS. 1 and

2. Specifically, the page information display program

10   comprises, as the commands for operating the display

controller 3, a page turning operation detecting command

for outputting a page turning operation detecting signal

when a dragging is made on the touch panel in parallel or

anti-parallel to a predetermined page turning direction

15   at a current page read from the electronic information

memory that is to be displayed at present, a next display

page setting command for setting a preceding page or a

succeeding page immediately before or after the current

page depending on a direction of the dragging operation

to a next display page to be displayed at the next time,

when the page turning operation detecting signal is output,

and a page turning process command for displaying the next

display page set in accordance with the next display page

5   setting command in place of the current page on the touch

panel.   If each of the commands is executed by the display

controller 3, the configuration as shown in FIG. 2B is

realized, so that the process of FIG. 1 is performed.   When

the page information display device has the function added

10   or changed, a command corresponding to the function to be

added or changed may be newly introduced.

This page information display program is stored in a

storage medium 17 such as a CD-ROM, read by a disk drive

16 as shown in FIG. 2A, and stored in a hard disk, not shown.

15   The page display program stored in the hard disk is employed

by the display controller 3.

One example of judging the page turning operation or

not is a judgment with the change and locus of operated

coordinates.   As shown in FIG. 2A, the xy coordinates are

defined on the display unit (operation unit) 1, the amount

of movement from an input coordinate (Px, Py) when the

fingertip first touches at the operation unit 1C to an input

coordinate (PX, PY) to which the fingertip is moved within

5   a fixed time is measured. Herein, it is assumed that the

amount of movement |PY-Py| in the Y axis direction is

smaller than an arbitrary value (DY), and the amount of

movement |PX-Px| in the X axis direction is larger than

an arbitrary value (DX). That is, the operation in the page

10   turning direction is beyond the arbitrary value (DX), while

the amount of movement of pointer in a direction orthogonal

to the page turning direction is below the arbitrary value

(DY). And if a value of "PX-Px" is negative, the next

display page setting portion 61 sets the page information

15   of a succeeding page of the current page to the next display

page. On the other hand, if the value of "PX-Px" is

positive, it sets a preceding page of the current page to

the next display page.

Accordingly, if the pointer 2A is moved to the right on the operation unit 1C in FIG. 2, for example, the page information displayed is turned from left to right, while the next page appears. Similarly, if the pointer 2A is moved to the left, the page information displayed is turned from right to left, while the preceding page gradually appears. In this way, an access method for accessing the page information by turning the pages one after another can be implemented in such a manner as to display the page information while visually presenting how the page is turned. That is, in this example, by detecting the movement direction of the pointer (input cursor) residing on the display unit 1 and the operation unit 1C, an intuitive access operation is enabled by simulating the operation of turning directly the page or chapter with a fingertip.

The operation with the tag or in the information access area may be performed by controlling the number of turning pages or the display rate in continuous display in accordance with the operation rate or pressure. In this

way, it is possible to effect the display control in more

intricate manner through the more intuitive operation.

Second embodiment

In the second embodiment, a process of holding plural

5   pages is introduced to improve the operability while

maintaining the intuitive operation.   FIG. 4 is a flowchart

illustrating a configuration of the page holding process

according to the second embodiment of the invention.   As

shown in FIGS. 2 and 4, the page information display method

10   of the second embodiment comprises a page holding operation

detecting step A11 of outputting a page holding operation

detecting signal when a predetermined page holding

operation is made at a current page read from the electronic

information memory 4 that is to be displayed at present,

15   a holding page number displaying step A12 of displaying

the total number of holding pages in accordance with the

amount of the page holding operation on the display unit,

when the page holding operation is initially detected in

this page holding operation detecting step A11, a next

display page setting step A13 of setting a page having a

page number that is equal to the current page added or

subtracted by the amount of the holding operation to a next

display page to be displayed at the next time, when the

5   page holding operation detecting signal is output in the

page holding operation detecting step A11, and a page

turning process step A14 of displaying the next display

page set in this next display page setting step A13 in place

of the current page on the display unit.

10   The page holding operation detecting step further

comprises a pressure holding page number calculating

substep of calculating the number of holding pages in

accordance with the magnitude of a pressure applied to the

substantially same position of the operation unit 1C, when

15   the operation unit 1C is a pressure detecting type, for

example. Also, the page holding amount operation

detecting step may comprise a time holding page number

calculating substep of calculating the number of holding

pages in accordance with the elapsed time of a depressing

operation that continues at the substantially same position of the operation unit 1C, instead of the pressure holding page calculating step. Accordingly, in this embodiment, an operation of turning plural pages continuously while grasping a book at the ends with a pressure to turn a few pages of the book is metaphorically simulated to realize a process of "holding" plural pages in accordance with a pressure applied on the display unit 1.

The page turning process step A14 executes a process of turning pages by effecting a page turning operation of moving the fingertip left or right in a state of holding plural pages. If the user holds plural pages but releases hold of the touch panel without effecting the page turning operation, holding plural pages is canceled, and an original operation state is restored.

To indicate the number of holding pages, various forms of display may be adopted. The total number of holding pages grasped actually may be indicated in numerical value,

but the state of holding pages may be indicated in some

form. For example, FIG. 5 is an explanatory view

illustrating a display example of the number of holding

pages with the configuration as shown in FIG. 4, wherein

5   FIG. 5A is a view illustrating a pressure circle, and FIG.

5B is a view illustrating a time circle. In the examples

as shown in FIGS. 5A and 5B, the holding page number display

step as shown in FIG. 4 comprises a substep of displaying

the holding display circles 63, 64 defined with a radius

10   of the size corresponding to the amount of holding pages

on the display unit 1.

By displaying this holding display circle 63 on the

display unit, the number of holding pages with an operation

can be intuitively grasped. In the pressure circle as

15   shown in FIG. 5A, the diameter of the circle around the

fingertip is increased or decreased in accordance with the

magnitude of pressure. The term "in accordance with the

magnitude of pressure" not only means that the diameter

of circle is proportional to the pressure, but also means

that the diameter of circle is increased acceleratively

in accordance with the pressure (the number of holding pages

is increased). In the case where the operation of a

plurality of turning pages with pressure is performed, the

5 maximum diameter ($<\infty$) is set in an initial file, because

the number of holding pages may depend on the resolution

of a pressure sensor. The radius of the pressure circle

can be calculated in accordance with the following

expression.

10 (Diameter of pressure circle) = (maximum diameter) ×

(current pressure value)/(resolution of pressure sensor)

(Number of holding pages) = (diameter of pressure

circle)/(differential threshold for user's pressure)

In order to implement a page turning operation with

15 the finger, and a function of holding plural pages

(hereinafter referred to as a plural pages turning

operation) with the pressure or time, it is necessary that

the system can readily discriminate a difference between

the page turning operation and the plural pages turning

operation. In this embodiment, to validate the plural

pages turning operation, this difference can be

discriminated as the fingertip is kept for a certain time

while touching at the touch panel as shown in FIG. 5C. To

5   clarify that the plural pages turning operation is

effective, the pressure circle is displayed in reduction

around the fingertip if the plural pages turning operation

is validated, as shown in FIG. 5D.

When plural pages are turned with the time as shown

10   in FIG. 5B, the number of holding pages is increased in

accordance with the length of the elapsed time. The

diameter of the time circle, unlike the pressure circle,

may become infinite unless the maximum diameter is set.

In other words, in the case where plural pages are held

15   with the time, it is possible to hold as many turning pages

as present. In the case of the pressure circle, the

diameter can be set to be infinite, but because the pressure

sensor has a limited resolution, the operation becomes very

sensitive, if the diameter is set to be infinite. An

algorithm for calculating the diameter of the time circle

(corresponding to the pressure circle) is as follows.

(Diameter of time circle) = F (elapsed time)

(Number of holding pages) = (constant) × (diameter of

5 time circle)

F (elapsed time) signifies a function having a variable

of the elapsed time. Herein, this function is assumed to

be increasing.

FIG. 6A is a view illustrating a configuration of a

10 page information display device. As shown in FIG. 6A, in

the page information display device of the second

embodiment, the display controller 3 comprises a page

holding operation detecting portion 64 for outputting a

page holding operation detecting signal when a

15 predetermined page holding operation is performed at a

current page read from the electronic information memory

4 that is to be displayed at present, and a holding page

number display unit 65 for displaying the total number of

holding pages in accordance with the operation amount of

the page holding operation on the display unit, when the

page holding operation is initially detected by the page

holding operation detecting portion. The other

configuration is the same as the first embodiment of FIG.

5   2. The page holding operation detecting portion 64 detects

the number of holding pages in accordance with the pressure

or elapsed time applied on the operation unit 1C. And the

holding page number display unit 65 displays this holding

page number on the display unit 1.

10   In order to realize the display controller 3 as shown

in FIG. 6, the page information display program comprises

a page holding operation detecting command for outputting

a page holding operation detecting signal when a

predetermined page holding operation is performed at a

15   current page read from the electronic information memory

that is to be displayed at present, and a holding page number

display command for displaying the total number of holding

pages in accordance with the operation amount of the page

holding operation on the display unit, when the page holding

operation is initially detected upon the page holding

operation detecting command.

In FIG. 6A, a pressure circle 63A is displayed on the

display unit. The pressure circle 63A is only drawn with

5 an outer contour, and the article under the circle can be

read during the operation. On the other hand, the actual

number of holding pages can not be displayed, but the number

of holding pages can be approximately grasped in terms of

the diameter in this example. Hence, multiple operations

10 may be needed. On the contrary, in the example as shown

in FIG. 6B, the number of holding pages is displayed in

numerical value inside (or around the circumference of)

the pressure circle. In the example as shown in FIG. 6B,

four pages are being held, and if the page turning operation

15 is performed in this state, a preceding or succeeding page

by four pages before or after the current page is displayed,

depending on a direction of the page turning operation.

FIG. 7 is an explanatory view illustrating one example

of displaying a multiloop with the configuration as shown

in FIG. 4. In the example as shown in FIG. 7, the holding

page number displaying step A12 comprises a substep of

displaying a multiloop consisting of a number of circles

around the same center and corresponding to the page holding

5   amount. With this method of displaying the multiloop, the

number of loops increases or decreases like a tree ring

with the greater or smaller pressure. Therefore, the loop

serves as a memory for holding pages. The number of holding

pages is calculated readily by changing the color or the

10   line thickness of loop at every five pages, for example.

That is, as the rule of 5cm or 10cm has the graduation that

is easy to read, the color or the line thickness of loop

may be changed as a memory at every five pages. In the

example as shown in FIG. 7B, there is a circle indicating

15   the holding in an inner region, with a number of loops

corresponding to the number of holding pages around its

outer circumference. The multiloop 63C as shown in FIG.

7B indicates that two pages are being held, and the

multiloop 63C as shown in FIG. 7C indicates that four pages

are being held. Also, the circle indicating the holding

may be omitted.

FIG. 8 is an explanatory view illustrating one example

of displaying a coated circle with the configuration as

5   shown in FIG. 4. In the example as shown in FIG. 8, the

holding page number displaying step A12 comprises a substep

of displaying a coated circle defined with a radius of

predetermined size, the circle being coated corresponding

to the page holding amount. For the coated circle, various

10   forms of coating may exist as shown in FIGS. 8 and 9. The

coated circle desirably has its diameter varied

corresponding to the holding page number in each form of

coating, but the number of holding pages may be indicated

according to the coating color or the extent of variation.

15   In this case, the coated circle itself has its fixed

diameter.

FIG. 8A is a view illustrating one example of the coated

circle in a solid single color. In the coating of solid

single color, the content of the page information at the

current page can not be read, and hence, this solid coating

in single color may be confused with the operation of

enlarging part of the page information. FIG. 8B is a view

illustrating one example of a coated circle having

5   transparency. If the coated circle is translucent, the

article under the coated circle can be read even during

the operation of turning plural pages.

FIG. 8C is a view illustrating one example of a coated

circle having gradation. This display method is suitable

10   employed when the number of holding pages is detected using

the pressure. This gradation makes it possible to display

the limit of resolution or the current operation state

clearly by making dense the color in the central portion

in accordance with the magnitude of pressure. Even if the

15   actual pressure distribution is not displayed, this effect

can be obtained. That is, if the actual paper face is

pressed strongly (i.e., turning more pages corresponds to

an action of pressing on the paper face more strongly),

the paper face is sunk physically. Therefore, the circle

is gradated so that the color is dense (dark) in the central

portion with the high pressure, and becomes lighter toward

the outside. Thus, the operation state can be displayed

excellently. If the coated circle with gradation is

5 translucent, as shown in FIG. 8B, how the paper face is

sunk with pressure can be represented.

FIG. 9 is an explanatory view illustrating another

example of displaying a coated circle with the

configuration as shown in FIG. 4. This display method

10 represents a sense of how the paper face is sunk at the

fingertip by deforming the paper face three-dimensionally

in accordance with the pressure. In the example as shown

in FIG. 9A, an outside loop of the coated circle is drawn

with the line, but this outside loop can be omitted. The

15 term "three-dimensionally" does not necessarily mean

dealing the paper face as the three dimensional graphics,

but is met if a sense of sinking can be represented. For

example, the image data of a part of the current page drawn

with the reference as shown in FIG. 9B may be mapped onto

a framework as shown in FIG. 9C or 9D to represent the

deformation caused by the medium pressure or large

pressure.

Third embodiment

5   In the third embodiment, the current page being turned

and the next display page are displayed effectively to

promote an understanding of the correspondence between the

operation and process contents by displaying the reaction

or process of an access device as a result of operation

10   clearly.

FIG. 10 is a flowchart illustrating a process example

of selecting a display format according to the third

embodiment. Referring to FIG. 10, the page information

display method comprises a page turning operation

15   detecting step A21 of outputting a page turning operation

detecting signal having the number of holding pages and

a page turning direction defined, when a page turning

operation for turning one or more pages is performed in

the operation unit, a next display page setting step A22

of setting a preceding page or a succeeding page by the number of holding pages before or after the current page depending on the page turning direction to a next display page to be displayed at the next time, when the page turning

5   operation is completed in the page turning operation detecting step A21 and the page turning operation detecting signal is output, and a page turning process step of displaying the next display page set in the next display page setting step A22 in place of the current page on the

10   display unit.

And the page turning process step comprises a next display page reading substep A23 of reading the next display page from the storage unit, when the next display page is set, a turning state display data creating substep A24 of

15   transforming the current page data making up the current page that is being displayed on the display unit at every unit display time, as well as creating the turning state display data into which the current page is transformed, when the page turning operation detecting signal is output,

and a turning state display data overwriting step A25 of

overwriting the turning state display data created in the

turning state display data creating substep on the next

display data read in the next display page reading substep

5   at every unit display time until the turning state display

data is exhausted.

In this embodiment, a behavior of the page being

actually turned is visually displayed on the display unit

in performing the page turning process, to promote an

10   intuitive understanding that the current page is deleted

from the display unit 1 and the next display page appears

on the display unit 1. Also, if the page turning process

is displayed excellently, it is easier to learn that the

page turning operation performed by the user is correct.

15   Herein, the page turning operation detecting step A21

detects either turning one page in the first embodiment

or holding plural pages in the second embodiment. Turning

one page can be also considered as the operation of holding

one page. The next display page setting step A22

designates a next display page on the basis of the page

turning direction and the number of holding pages detected

in the page turning operation detecting step A21. The page

turning process comprises displaying the next display page

5   at stages, as well as deleting the current page at stages.

Therefore, the transformed current page is overwritten on

the next display page. There are various ways of

transforming the current page.

FIG. 11 is a block diagram illustrating a

10   configuration of the page information display device

according to the third embodiment. Referring to FIG. 11,

the page information display device comprises an

electronic information memory 4 for memorizing the

electronic information having plural pages of information

15   in a unit of page of predetermined size, a touch panel 1

for displaying the electronic information stored in the

electronic information memory 4 in the unit of page, as

well as inputting an operation to gain access to the page

information, and a display controller 3 for controlling

the display of the page information stored in the electronic

information memory on the basis of an operation content

input into the touch panel 1.

And the display controller 3, like that of the first

embodiment as shown in FIG. 2B, comprises a page turning

operation detecting portion 60 for outputting a page

turning operation detecting signal with the number of

holding pages and a page turning direction defined, when

a page turning operation for turning one or more pages is

performed on the touch panel, a next display page setting

portion 61 for setting a preceding page or a succeeding

page by the number of holding pages before or after the

current page depending on the page turning direction to

a next display page to be displayed at the next time, when

the page turning operation is completed in the page turning

operation detecting portion 60 and the page turning

operation detecting signal is output, and a page turning

process portion 62 for displaying the next display page

set in the next display page setting portion in place of

the current page on the display unit.

This page turning process portion 62, as shown in FIG.

11, comprises a next display page reading function 68 of

5   reading the next display page from the electronic

information memory, when the next display page is set, a

turning state display data creating function 69 of

transforming the current page data making up the current

page that is being displayed on the touch panel 1 at every

10   unit display time as well as creating the turning state

display data into which the current page is transformed,

when the page turning operation detecting signal is output,

and a turning state display data overwriting function 70

of overwriting the turning state display data created in

15   the turning state display data creating function 69 on the

next display page read in the next display page reading

function 68 until the turning state display data is

exhausted.

A page information display program for realizing the

page turning process portion as shown in FIG. 11 comprises,

as the page turning process commands, a next display page

reading command for reading the next display page from the

5   electronic information memory, when the next display page

is set, a turning state display data creating command for

transforming the current page data making up the current

page that is being displayed on the display unit at every

unit display time as well as creating the turning state

10 display data into which the current page is transformed,

when the page turning operation detecting signal is output,

and a turning state display data overwriting command for

overwriting the turning state display data created in

accordance with the turning state display data creating

15 command on the next display page read in accordance with

the next display page reading command at every unit display

time until the turning state display data is exhausted.

Referring to FIGS. 12 and 13, a form of transforming

the current page (i.e., a display format of the page turning

process) will be described below.   In the examples as shown

in FIGS. 12 and 13, the page turning direction is leftward

in the figure, and for the simplification of explanation,

the page information has an alphabet or a triangle or circle

5   over the entire surface.   FIG. 12A is a view illustrating

one example of the display format of overwriting type.   In

the example as shown in FIG. 12A, the turning state display

data creating step A24 further comprises an overwriting

display control substep of deleting an area on the start

10   point side in the page turning direction at every unit time.

In the example as shown in FIG. 12A, the turning state

display data 71A is produced by deleting a current page

71 from the right hand side in the figure at stages.   By

overwriting this turning state display data 71A on the next

15   display data 72, the turning state is displayed.   In this

overwriting type, the next display data successively

appears from the right hand side of the current page.

FIG. 12B is a view illustrating one example of the

display format of slide type.   In the example as shown in

FIG. 12B, the turning state display data creating step A24

comprises a slide display control substep of deleting an

area on the end point side in the page turning direction

at every unit time as well as shifting the current page

5 data by the amount of deleted area in the page turning

direction. In the example as shown in FIG. 12B, the left

hand side of the current page data 71B is deleted in the

figure, and the current page data is shifted by the amount

of deleted area in the page turning direction. This

10 shifted image data as the turning state display data 71C

is overwritten on the next display page 72. In the example

as shown in FIG. 12B, the current page is slid gradually

in the page turning direction so that the next display page

72 appears.

15 FIG. 13A is a view illustrating one example of the

display format of compression type. In the example as

shown in FIG. 13A, the turning state display data creating

step A24 comprises a compression display control substep

of reducing the display length in the page turning direction

at every said unit time as well as compressing the current

page data to the reduced display length in the page turning

direction. In the example as shown in FIG. 13A, it is

allegorized that the current page is lifted in a normal

5 direction (z axis direction) of the display unit at the

end (or left end in the figure) along the page turning

direction. If the display area of the current page 71 is

reduced and compressed in the page turning direction, the

current page has a shape as indicated by reference sign

10 71D. Then if further compressed, the current page has a

shape as indicated by reference sign 71E. If they are

overwritten on the next display page 72, the current page

has its shape changed sequentially from a state indicated

by reference sign 73D to a state indicated by reference

15 sign 73E. Defining θ in the xy plane as shown in FIG. 13A,

the current page 71 is transformed so that the change rate

(or angular velocity) of θ may be constant. Thereby, the

behavior of how the page is turned can be represented

dynamically.

FIG. 13B is a view illustrating one example of the display format of 3D type. In the example as shown in FIG. 13B, the turning state display data creating step A24 comprises a three dimensional space defining substep of defining a virtual space in a normal direction of the display unit, a current page rotating substep of rotating the current page within the virtual space around the end point side in the page turning direction, and a three dimensional display control substep of drawing a front side and a back side of the current page rotated virtually in the current page rotating substep in a two dimensional plane as viewed in a normal direction of the display unit as well as setting the drawing data to the turning state display data. In the example as shown in FIG. 13B, the state of turning the paper in the three-dimensional space is displayed on a two-dimensional plane. As an example of rotating the current page, there is a shape as indicated by reference sign 71G in FIG. 13B. In this case, the backside of the current page is indicated by reference sign

71H. The current page is drawn in the two-dimensional

plane, and superposed on the next display page 73F,

resulting in a shape as indicated by reference sign 73G.

In this embodiment, because the page information is not

5   displayed on the back side of the page, the current page

may be drawn in a state where the content of the current

page is seen through the back side, or the content of the

next display page is reflected on the back side of the

current page.

10   Fourth embodiment

In the fourth embodiment, for the purpose of an easy

understanding of the relation between the operation

content and the process content in order to enhance the

operability with the tag, the tag is effectively used for

15   the display of the operation state. That is, in the fourth

embodiment, as a method of indicating the total number of

pages and the position of the current page as well as

enabling an operation of turning the pages intuitively,

the tag is employed. Referring to FIGS. 14 to 28, the

method of displaying the tag will be described below, and

then the relation between holding plural pages and the tag,

and the extended use of the tag in the third embodiment,

will be described below.

5   FIG. 14 is a flowchart showing a page information

display process according to the fourth embodiment of the

invention. FIG. 15 is a block diagram showing a

configuration of a page information display device which

is suitable for practicing this process. In this

10   embodiment, a display unit 1 is provided with an information

access area 5 for displaying the page information, as shown

in FIG. 15. Further, one and other tag display areas 6,

7 are provided to the left and right, or upward and downward

of this information access area 5. A tag of a page

15   displayed in the information access area is displayed in

a right-side tag display area. Beneath this current page

tag, a tag for a succeeding page (succeeding page tag 9)

having a page number greater than a current page is appended.

And in a left-hand tag display area, a tag for a preceding

page (preceding page tag 10) of the current page is appended.

In an example of FIG. 15, the fourth page is displayed.

In the example as shown in FIG. 15, the page information display device comprises a storage unit (electronic

5 information memory) 4 for storing the electronic

information having a plurality of pages in a unit of page

of predetermined size, a display unit (display) 1 having

an information access area 5 for displaying the electronic

information stored in the storage unit 4 in a unit of the

10 page and a tag display area 6, 7 for displaying a tag

indicating the content of the page, the tag display area

being provided on both ends of the information access area

5, and a display controller 3 for displaying the page

information read from the storage unit 4, with a tag

15 appended, on the display unit. The display controller

executes the process as shown in FIG. 14.

Referring to FIG. 14, the display controller first

reads the electronic information of a page designated with

page designation information (step S1). Subsequently, the

height of a current page tag is determined, on the basis

of the page number of read current page (step S2,

determining the current page tag height). Further, the

color and shape of a tag indicating each page preceding

5   and succeeding the current page are determined (step S3).

At this step S3, the highlighting of current page tag, the

tag color or color variation, and the tag shape variation

are set.

Subsequently, the current page of current display

10   object read from the storage unit is displayed in the

information access area at step S4. Further, the tag

appendant to the current page is displayed in the one or

other tag display area at step S5 (displaying the current

page). And before or after displaying the current page,

15   a tag 9 appendant to each page (fifth to seventh page)

following the current page (fourth page in the example of

FIG. 15) is displayed in one tag display area (S6,

displaying the succeeding page tag). Also, before or after

displaying the current page, a tag appendant to each page

preceding the current page in page number is displayed in

the other tag display area (S7, displaying the preceding

page tag). In the example of FIG. 14, each tag has the tag

content displayed, the tag content being a content of tag

5   (step S8). In the example as shown in FIG. 15, the page

number is displayed as the tag content (displaying the page

number). Other than the page number, a mark or character

indicating the place of page may be used.

Referring to FIG. 15, the display controller 3 has a

10   variety of functions to implement the process as shown in

FIG. 14. Specifically, it comprises an electronic

information display portion 11 for displaying the page

information of a current page of current display object

read from the storage unit 4 in the information access area

15   5, and a current page tag display portion 12 for displaying

the current page tag in the one or other tag display area.

The display controller 3 further comprises a succeeding

tag display portion 13 for displaying a tag appendant to

each page following the current page at a position forward

of the height of the current page tag in the one tag display

area, and a preceding page tag display portion 14 for

displaying a tag appendant to each page preceding the

current page in page number at a position rearward of the

5   height of current page in the other tag display area.   In

a preferred embodiment, the display controller 3 comprises

a tag display mode setting portion 15 for setting the mode

of tag (shape and color). The current page tag display

portion 12 may have a current page tag height calculating

10   function of calculating the page height of current page,

on the basis of the ratio of the page number of current

page relative to the total page number of electronic

information.

The display controller 4 comprises a CPU for executing

15   a page information display program and a RAM which is a

main memory of this CPU. The page information display

program is stored in a storage medium such as a CD-ROM and

carried to the page information display device. The

display controller 4 controls a program reading portion

16 such as a CD-ROM drive to read a program and store it

in the storage unit 4. If this page information display

program is executed, all or part of the process as shown

in FIG. 14 is performed.

5   This page information display program may comprise the

commands for operating the display controller 4 including

a current page display command for displaying a current

page of current display object read from the storage unit

4 in the information access area 5 and displaying a tag

10 appendant to the current page in the one or other tag display

area 6, 7, a succeeding page tag display command for

displaying a tag appendant to each page following the

current page in the one tag display area, before or after

displaying the current page, and a preceding page tag

15 display command for displaying a tag appendant to each page

preceding the page number of the current page in the other

tag display area, before or after displaying the current

page.

As shown in FIG. 15, the display 1 consists of the

information access area 5 and the tag display areas 6, 7

provided on the both sides of the information access area

5. For example, the electronic information display

5　portion 11 draws the access information stored in the

storage unit 4 in the information access area 5 of the

display 1. Further, the tag display mode setting portion

15 specifies the tag display mode in accordance with the

preselected setting. Subsequently, each tag display

10　portion 12, 13 and 14 draws one sheet with tags 8, 9, 10

indicating the tag contents 18 such as the page number

appended in the tag display area 6, 7, having an appearance

with a tag added sheet. The current page tag 8 appended

to the current page displayed in the information access

15　area 5 has desirably a specific appearance of color or shape

with a highlighted font for the tag content 18 such as the

page number, for example, to easily distinguish it from

other tags 9, 10.

Each tag 8, 9, 10 is arranged in accordance with the tag content 18 such as the page number. To make the page arranging order of the page information clear, the absolute positional relation of information provided for the computer is clarified by drawing comically the overlapping condition of tags. For example, the tag 10 displayed in one tag display area 6 has a smaller page number than the page number of the current page. The tags are displayed in overlapping condition so that the tag having a greater page number is placed visually in front of the tag having a smaller page number. Further, the tag displayed in the other tag display area 7 has a greater page number than the page number of the current page. The tags are displayed in overlapping condition so that the tag having a greater page number is placed visually in the rear of the tag having a smaller page number.

As compared with the tag content 18 such as the page number of the tag 8, 9, 10 appended in the information access area 5, the tag having a greater tag content 18 such as

page number is displayed in one tag display area 6, and

the tag having a smaller page number is displayed in the

other tag display area 7. Also, the tags 8, 9, 10 are

displayed differently in appearance in accordance with the

5   page number of tag, which is an effective drawing method

for clarifying the relative positional relation of access

information.

FIG. 16 is an explanatory diagram showing an initial

state of the tag display according to this embodiment of

10   the invention. FIG. 17 is an explanatory diagram showing

a tag display example in which the fourth page is displayed

in the configuration as shown in FIG. 16. Herein, the

display unit 1 has the information access area 5 and the

tag display areas 6, 7. The electronic information 1A

15   stored in the storage unit 4 is displayed in the information

access area 5 by reconstructing, as the page information

in a unit of page, the amount of information which can be

displayed in the information access area 5. The page

information is data in a unit of page of predetermined size.

The page information display device arranges the tags

8, 9, 10 in the order of the tag content 18 such as the

page number, with each tag 8, 9, 10 appended to the extremity

of each page marking the tag content 18 such as page number,

5   to exhibit that the arrangement of page information has

a linear information structure, so that the page

information in a unit of page can be superposed in

succession like a book.

In the example of FIG. 16, the total page number of

10   electronic information is 7 pages. Seven tags having the

length of the tag display area 7 divided by the page number

7 are displayed. In order to overlap the tags, as shown

in FIG. 16, this tag length is equal to the length divided

plus the overlapping length. Typically, for the tag 8

15   appendant to the current page, the height or position of

tag in a tag display direction may be determined, on the

basis of the ratio of the page number of current page to

the total page number of electronic information, at a step

S2 of determining the current page tag height as shown in

FIG. 15.

In the example as shown in FIG. 16, the page number

of the page with the tag appended is displayed as the tag

5   content indicated within the tag at a step S8 of displaying

the page number. Accordingly, the number appended to the

tag in FIG. 16 is the page number of electronic information.

As shown in FIG. 16, even in the case where the page

information is accessed using only one information access

10 area 5, the tag having the page number is displayed in the

tag display area, so that the user can see intuitively the

total amount or depth of electronic information. And in

the example of marking the tags 8, 9, 10 with the page number,

unlike the tag having the heading information marked, there

15 is no problem that the page number can not be fully written

in the tags 8, 9, 10. Of course, if there is a sufficient

space in the tag display area 6, 7, an icon or the like

suggesting the content of character information or page

information may be attached.

Before or after the step S8 of displaying the page number, the current page tag 8 may be highlighted. In the example as shown in FIGS. 16 and 17, the bold character is used as the font of current page tag.

5   Referring to FIGS. 16 and 17, the overlapping of tags will be described below. Firstly, with respect to the current page tag 8, as shown in FIG. 16, the succeeding page tags 9a to 9f are lower level tags. The order is such that the tag is at lower level as the page leaves away from the current page. Accordingly, the current page tag 8 is at the uppermost level. And the tags 9a, 9b, …, 9f are placed at lower level in the order of 9a, 9b, …, 9f. The overlapping of tags is such that the lowermost tag 9f is at the lowest level, and the tags are overlapped in the order of 9e, 9d, …, 9a. Thus, the user can understand the structure from the current page to the seventh page at a glance. In a case where there is an operation of gaining access to the fourth page, the preceding page tags are transferred to the one tag display area 6 in this embodiment,

as shown in FIG. 17, rather than changing the overlapping

relation only in the other tag display area 7. Thereby,

the position of current page relative to the total page

number of electronic information can be quickly and

5   correctly informed to the user.

As shown in FIG. 17, among the preceding page tags 10,

a tag 10c indicating a previous page (third page) of the

current page is at the uppermost level, and the tag having

smaller page number is placed at the lower level. Thereby,

10   the depth of electronic information can be represented.

After all, the hierarchical relation is such that the

current page is at the uppermost level, and the page is

positioned at lower level as the absolute value of a

difference between the page number of the page and the

15   current page number increases. Therefore, at a step of

defining the tag relation, the current page tag 8 or the

page tag preceding or succeeding the current page is at

the uppermost level, and the page is positioned at lower

level as the absolute value of a difference between the

current page and the page for appending the tag increases.

And at a step of setting the overlapping, the upper level

tag overlaps the lower level tag in the one or other tag

display area in accordance with the hierarchy of the page

5   defined at the step of defining the tag relation. To

clarify the order of arranging the pages, the depth of page

can be visualized on the tag display area 6, 7 by comically

drawing the overlapping of tags. In this way, in this

embodiment, the tag 8, 9, 10 indicating the tag content

10   18 such as the page number is appended to the page

information, which is then displayed in the tag display

area 6, 7. Using an input unit 2, the tag 8, 9, 10 can be

directly designated. The page information corresponding

to the tag content 18 such as the page number for the tag

15   8, 9, 10 is displayed in the information access area 5.

Then, the display mode for the tag 8, 9, 10 appended to

the page information is changed, thereby making it possible

to easily grasp the amount of information or the information

structure provided for the computer. This is because the

comparison between the number of tags in one tag display area 6 and that in the other tag display area 7 is visually easily made as shown in FIG. 15.

Further, in this embodiment, it is also possible to detect an input operation for accessing the page information such as turning the page in the information access area 5. For example, using a pointing device for the input operation with a fingertip such as a touch panel over the tag display area 6, 7 for input, there is provided a user interface which enables an access operation to be performed intuitively with the gesture of turning the page.

In the example of effecting the process as shown in FIG. 14, an access area and an operation area are provided in the display area on an output device of the computer to enable the electronic information displayed in the information access area to be fully listed. Further, the amount of information which can be displayed in the information access area is appropriately drawn by appending the tag indicating the page number to the

electronic information in a unit of page, with the

overlapping of tags. Therefore, the user can easily grasp

visually the electronic information arranged for each page.

The user unfamiliar with the computer can also easily

5   understand the information structure in the order of pages

for the electronic information.

According to this embodiment of the invention, the

user can easily grasp visually the absolute position of

the page being currently accessed with respect to the amount

10   of information provided for the computer in the order of

arranging the tags. And the user can also easily grasp the

relative position between the page or chapter being

currently accessed and the arbitrary page or chapter, using

the order of arranging the tags.

15   FIG. 18 is an explanatory diagram for defining the

terms such as "tag width" for use in the present

specification. Normally, in the English text or Japanese

text written laterally, the characters are written from

left to right and the page is turned from right to left.

On the other hand, for the Japanese text written vertically,

the page is turned from right to left. Also, in the case

where the A4 sheets of paper for a report are fastened at

the upper side, the page is turned from bottom to top. In

5   this way, the direction of turning the pages may exist in

the books, reports or magazines. Herein, a term "page

turning direction" referred to above means one direction

as indicated by reference numeral 34, or a direction of

turning the page from right to left in FIG. 18. The page

10   turning direction is typically parallel (or anti-parallel)

to the character writing direction, or orthogonal to it.

In this embodiment, a term "tag display direction" is

defined as a direction orthogonal to the page turning

direction. The tag is displayed along this tag display

15   direction 35. When turning the page from right to left,

the tag display direction is from top to bottom. When

turning the page from bottom to top, the tag display

direction is from left to right as shown in FIG. 14.

Herein, a term "tag length" is defined as a distance from the start point of tag to the end point in the tag display direction. A term "tag width" is defined as a length of tag in the page turning direction. Accordingly,

5 if the tag length and the tag width are determined, the size required to display one tag can be determined. In this embodiment, the position of arranging the tag is variable along the tag display direction, depending on various elements. Herein, a term "tag height" can be defined as

10 a length from one end point in the tag display direction. When the tag is trapezoid, the elements specifying one tag are "tag length", "tag width" and "tag height", as far as the angle of trapezoidal side face is determined.

<Adjusting the tag length at the start time of access>

15 In this embodiment, a method of determining the tag length at the start time of access is disclosed. The electronic information 1A or electronic information 1B has the total page number which is variable depending on its contents. In the example as shown in FIGS. 16 and 17, the

length in the tag display direction divided by the total

page number is equal to a tag length. However, as the total

page number increases, the tag length is too short to effect

a simple uniform allocation. In an example as shown in FIG.

5   19, solving means for favorably effecting the tag display

when the total page number is large is shown.

.When there are so many number of pages that it is

difficult to draw the tags in the operation area with

sufficient tag interval, the tag is drawn by gradually

10   narrowing the interval between adjacent tags up to a certain

page at the height proportional to the absolute value of

a difference in the page number between the tag associated

with the access area and other tags as shown in FIG. 20

(semantic display). The tags beyond the certain page range

15   are superposed and drawn densely with a fixed tag interval.

Since in the semantic display the tag length is shorter

successively for every tag, the tags for the current page

and its neighboring pages can excellently have the tag

content such as page number, and the position of the current

page relative to the total page number is clear. Further, an interface which enables the user to detect the total page number at a glance can be constructed.

Referring to FIG. 19, first, the length of a current

5 page tag 8 appendant to the current page is determined by referring to the tag length as the reference (step S41, a step of calculating the tag length). Subsequently, the length of each tag is set to be shorter at lower hierarchical level, with the tag length of the current page tag 8 as

10 the maximum value (step S41, a step of creating the semantic display). And when the length of tag display area is too insufficient for the total page number, a line tag display 51A is set for a certain range (step S43, a step of setting the line tag). And the tags are displayed semantically

15 (step S44). Depending on the content of page information, an interval display line for changing the thickness of tag contour line may be inserted at every page intervals (a step of inserting the interval display line). And the tag content such as page number is displayed for the tag capable

of indicating the tag content in accordance with the tag
length and the font size for display (step S46). Further,
the page information of current page is displayed in the
information access area.

5   Referring to FIG. 20, the current page is the 28th page.
With the tag length of this current page tag 8 as the maximum
value, the tag length is shorter in the order of tags 9a,
9b, .., 9e. In this example, the tag length is 0.8 times
the previous one for each tag from the current page to effect

10   the semantic display. Among the tag shapes indicated by
reference sign 51A, the line tags which have only lower
lines displayed are also implemented by this multiplier
of 0.8. If the resolution of the display can not follow
the line interval of tag, the tags are continuously

15   displayed by the line. In the example of FIG. 20, the
previous and next tag lengths are 0.8 times the current
tag length, with the tag length of the current page tag
8 in the other tag display area 7 as the reference. As a
result, the tag length which is displayed at the uppermost

level (tag for 27th page) in the one tag display area is equal to the tag length indicating the 29th page. In this way, by making the tag length of the previous page shorter than the tag length of the current page, the current page

5 tag is highlighted, with more deepness.

The semantic display as shown in FIG. 20 may be made at any time, irrespective of the total page number of page information. But in the case where the total page number is small, the semantic display may impede the effective

10 use of the tag display area. Therefore, it is desirable to switch between the normal display as shown in FIGS. 16 and 17 and the semantic display as shown in FIG. 20 in accordance with the total page number of page information. This switching of display mode can be made based on the

15 minimum reference length of the current page tag. That is, when all the tags are allocated over the entire length of the tag display area in the tag display direction, as shown in FIG. 16, the semantic display may be effected, as far as the tag length per tag is below the reference length.

FIG. 21 is a table showing a data structure of the page

information display data required to switch between these

display modes. The minimum reference length is simply

determined by the number of dots, as shown in FIG. 21A,

5   when the physical length and resolution of the display are

predetermined. On the other hand, to provide a data

structure not dependent on the actual display, an input

of the physical length and the number of dots for display

may be accepted at the time of execution, and the minimum

10   reference length may be determined by the physical length

in meter or the like. In this way, the user can use

uniformly various apparatuses in respect of different page

turning operations or different displays of deepness using

the tag. When the semantic display is made, the sense of

15   deepness can be represented corresponding to the total

number of pages, even if the tag display area is not

necessarily provided on the left and right sides. However,

from the aspect of recognizing the current page position

promptly, the tag display area is desirably provided on the left and right sides.

In the example of FIG. 21A, the page information display data includes the display dot number data of the display unit in each of the page turning direction and the tag display direction, the total page number data of electronic information stored in the storage unit, the dot number data per unit tag which is equal to the number of dots in the dot number data divided by the total page number in the total page number data, and the minimum reference data having the minimum reference width of tag which is predetermined for the tag length in the page turning direction and the minimum reference length of tag which is predetermined for the tag length in the tag display area, which are in comparison with the number of dots per unit tag. In the example of FIG. 21A, the length of unit tag is selected to a larger value between 80 dots which is the minimum reference length and the value of 1600 dots divided by the total page number ap. Using this data, it is

possible to determine the tag length of current page tag,

and switch between the normal display and the semantic

display.

In the example of FIG. 21B, the minimum reference

5   length is selected to a larger value between 2cm or the

value of the tag display area length divided by the total

number page ap.   The page information manager 43 can obtain

the physical length per dot from the relation between the

display dot number data and the tag display area length,

10   and thereby the number of dots per unit tag length.

The page information display data may have the tag

ratio data which is referred to when the dot number data

per unit tag is shorter than the minimum reference data.

This tag ratio data is a ratio of the tag length varied

15   successively from the current page of electronic

information to the end page or start page relative to the

tag length of the minimum reference data.   And the tag

length is calculated successively from higher to lower

hierarchy by referring to this tag ratio data.   Then, the

tag is overwritten in the tag display area from lower to higher hierarchy. In this way, the tags can be overlapped well. When the total page number is large, the line tag is automatically produced in accordance with the

5   resolution. Consequently, a consistent interface can be constructed.

FIG. 22 is a functional block diagram showing the configuration for designating the tag shape using the page information display data as shown in FIG. 21. In an example

10   of FIG. 22, there are provided a storage unit 4 for storing the electronic information having a plurality of pages in a unit of page of predetermined size, a display 49 having an information access area 5 for displaying the electronic information stored in the storage unit 4 in a unit of the

15   page, and a page information display portion 56 for enabling the electronic information stored in the storage unit 4 to be read on the basis of the page specifying information externally input, and displayed in the information access area.

The display 49 has a tag display area 6 provided along with the information access area on one end or both ends in the page turning direction to turn the page of page information in the information access area 5. Further, it comprises a tag shape calculating portion for calculating the length of tag appendant to each page in the tag display direction on the basis of the length of tag display area in the tag display direction which is orthogonal to the page turning direction, and the total page number ap of electronic information stored in the storage unit 4, and a tag display portion 55 for displaying the tag in the tag display area on the basis of the length of tag which is calculated by this tag shape calculating portion.

The tag shape calculating portion comprises a tag display area width determining portion 53 for determining the width of the tag display area, on the basis of the minimum reference width of tag and the size of electronic information in the page turning direction, for example. For example, if the residual length of the page turning

area when the longitudinal length of page information is

enlarged or reduced to the longitudinal length of the

display is below the minimum reference width, the

enlargement or reduction ratio of page information may be

5 changed. Also, the tag shape calculating portion

comprises a current page tag length setting portion 54 for

setting the tag length of current page to the tag length

per unit tag which is the length of the display 49 in the

tag display direction, divided by the total page number

10 ap of electronic information, and setting the length of

current page tag appendant to the page being currently

displayed to the minimum reference length, when the tag

length is shorter than the minimum reference length of tag.

When the tag length of current page is set to the minimum

15 reference length, the semantic display is made in this

example. Or otherwise, the normal display is made.

To display the tags on the basis of the minimum

reference length, a tag table (or the page information

display data as shown in FIG. 21) containing the minimum

reference width of tag in the page turning direction and

the minimum reference length of tag in the tag display

direction which are predetermined on the basis of the size

of the display 49 is stored in the storage unit 4. The tag

5   display portion 55 may display the tag having a width

determined by the tag display area width determining

portion 53 and a length determined by the current page tag

length setting portion 54 in the tag display area.

With the configuration as shown in FIG. 22, the

10   operation of each portion can be realized by the CPU and

the program, in the same way as shown in FIG. 15. For

example, a program for calculating the tag length, using

the page display information of the data structure as shown

in FIG. 21, has a tag length calculation command for

15   calculating the length of each tag appendant to each page

in the tag display direction on the basis of the length

of tag display area in the tag display direction and the

total page number ap of electronic information stored in

the storage unit 4, and a tag display command for displaying

the tag in the tag display area on the basis of the length

of each tag calculated in accordance with the tag length

calculation command. The tag length calculation command

contains a subcommand for effecting translation between

5   the physical length and the number of dots, if the minimum

reference length of FIG. 21B is the physical length.

FIG. 23 is s flowchart showing a process of determining

the tag width and the tag length using the data of the data

structure as shown in FIG. 21B. Firstly, the physical

10 length information of the display 49 in the page turning

direction is acquired (step S51, a step of acquiring the

physical length). Subsequently, the minimum reference

width of tag at the resolution of the display is calculated

on the basis of the physical length information acquired

15 at step S51 of acquiring the physical length and the minimum

reference width of tag in the page turning direction which

is predetermined by the physical length (minimum tag width

calculation step). And the width of the tag display area

is determined on the basis of the minimum reference width

dependent on the display 49 calculated at step S52 of

calculating the minimum tag width and the size of electronic

information (step S52 of determining the tag display area

width).

5   Subsequently, the physical length information of the

display in the tag display direction which is orthogonal

to the page turning direction is acquired (step S53, a step

of acquiring the physical length). Then, the minimum

reference length of tag at the resolution of the display

10   is calculated on the basis of the physical length

information acquired at step S53 of acquiring the physical

length and the minimum reference length of tag in the tag

display direction which is predetermined by the physical

length (minimum tag length calculation step). When the tag

15   length per unit tag which is equal to the length of the

display in the tag display direction divided by the total

page number of electronic information is shorter than the

minimum reference length, the length of current page tag

appendant to the page being currently displayed is set to

the minimum reference length (step S54, a step of setting the current page tag length).

And the tag having a width determined at step S52 of determining the tag display area width and a length determined at step S54 of setting the current page tag length is displayed in the tag display area (step S55, tag display step). Thereby, the tag having an excellent shape can be displayed without being dependent on the resolution.

FIG. 24 is a flowchart showing a process of switching between the normal display and the semantic display. As shown in FIG. 24, the total page number of electronic information is acquired in starting the display of page information (step S61). And the tag length per tag is calculated by dividing the number of dots in the tag display direction by the total page number (step S62). Then, a comparison is made between the calculated tag length and the minimum reference tag length as shown in FIG. 21 for example. If the calculated tag length is longer, the normal display is effected (step S64). On the other hand,

if the calculated tag length is shorter than the minimum

tag length, the semantic display with a multiplier of 0.8

is effected (step S65).

The page information display device for enabling the

5   selection of the display mode may comprise, in addition

to the configuration of FIG. 22, a tag display mode

selecting portion for selecting the normal display in which

the length of tag to be displayed in the tag display area

is a fixed length, when the total page number of electronic

10   information is a predetermined number or less, or selecting

the semantic display in which the tag length is reduced

stepwise from the current page tag, when the total page

number exceeds the predetermined number.

<Adjusting the tag length after turning the page>

15   A specific example will be described below in which

the tag is redisplayed, after some operation is applied

to the page information and tag on the display, and a

different page is displayed. As to how to display the tag

after turning the page, the adjustment of the tag height

is required.   In the example of FIGS. 16 and 17, the normal

display is effected.   The current page tag is moved from

the other tag display area 6 to the one tag display area

7 while maintaining the tag height constant.   In the

5   semantic display as shown in FIG. 20, the tag can not be

continuously moved with the constant tag height maintained.

In the present example, the measures for this point are

disclosed.

FIG. 25 is a flowchart showing a process for

10   redisplaying the tag after turning the page.   In an example

of FIG. 25, firstly, the tag height of current page is

calculated (step S71).   This step S71 of calculating the

current page tag height calculates the height of current

page tag appendant to the current page number of current

15   display object, on the basis of the ratio of the current

page to the total page number of electronic information.

In the normal display, the height of tag once displayed

is not changed.   On the other hand, in the semantic display,

the height of current page tag is changed in accordance

with the page number of current page to be displayed.

Subsequently, the current page read from the storage

unit 4 is displayed in the information access area. The

5 tag appendant to the current page is displayed in the one

or other tag display area 6, 7 at a current page tag height

calculated at step S71 of calculating the current page tag

height (step S72 of displaying the current page tag).

Before or after this step S72 of displaying the current

10 page, the tag 9 appendant to each page succeeding the

current page is displayed in the one tag display area 9

at a smaller height than the current page tag height (step

S73 of displaying the succeeding page tag). On the other

hand, the tag appendant to each page preceding the page

15 number of current page is displayed in the other tag display

area 10 at a larger height than the height of current page

tag (step S74 of displaying the preceding page tag).

Subsequently, the procedure waits for an operation of

turning the page (step S75). Further, when there is the

operation of turning the page, the page turning is displayed

like animation with the tag appended to the page being

turned, while maintaining the tag height of current page

tag, as shown in FIG. 26 (step S76). Then, the page after

5   being turned is set as the current page (step S77).

In this example, a process after resetting the current

page is different between the normal display and the

semantic display. That is, in the semantic display (step

S78), the tag height of current page is recalculated on

10   the basis of the ratio of the current page to the total

page number (step S71 of redisplaying the same ratio height

tag). On the other hand, in the normal display, the current

page tag is displayed while maintaining the height of each

tag (step S72 of redisplaying the same height tag).

15   Thereafter, this process is repeated.

A page display program for implementing this process

may have, for example, a tag length calculation command,

a normal display command, a semantic display command, and

a tag height control command. Specifically, the tab length

calculation command calculates the tag length per tag on the basis of the total page number information of electronic information and the length of the tag display area. The normal display command sets the calculated tag length to

5   a display tag length when the calculated tag length is above a predetermined tag length. The semantic display command sets the predetermined tag length to the tag length of current page when the calculated tag length is below the predetermined tag length and sets the length of tag appended

10 to each page preceding and succeeding the current page to a shorter length stepwise, with the tag length of current page at the uppermost level. The tag height control command redisplays the tag at the constant height of each tag during the normal display or by calculating the tag

15 height on the basis of the page number of a new current page during the semantic display when there is an operation of turning the current page displayed in the information access area. The semantic display command may be initiated when the normal display command can not be executed. Since

the tag height control command requires the information

of whether the normal display or the semantic display is

made, a flag indicating the current display mode may be

stored in the page table 41.

5   Referring to FIG. 26, the current page that is the

fourth page is turned when the fourth page is displayed.

Then, the fifth page is displayed.   To provide the user with

an impression like turning pages of the book, the display

area of the page being turned is reduced gradually and the

10   display area of a new page to be displayed next is increased

gradually in the example of FIG. 26.   This display example

involves various patterns, which may be selected in

accordance with the display processing ability of the

controller for use.   For example, if the controller can

15   perform a high speed 3D processing (with the CPU and

operating system), the state of turning the paper may be

displayed in the three dimensions.   Also, the page may be

revolved around the tag display area 6 in the tag display

direction as a central axis while the data being displayed

is transformed in accordance with the turning movement.

In the example of FIG. 26, the motion of turned page

is followed by the motion of tag, as indicated by reference

5   numeral 58. That is, the page information display method

of this example includes a page turning step of moving the

current page in the page turning direction, and displaying

a page to be displayed by a tag operation in the information

access area, when the tag operation is applied to a tag

10   displayed in the tag display area, and a tag moving step

of moving the tag appended to the current page between the

one and other tag display areas in the page turning

direction along with the movement of the current page, when

the current page is moved at the page turning step. Thereby

15   the position of page being moved becomes clear. Also, in

the example of displaying the page turning in the three

dimensions, the tag shape may be deformed and moved while

following the page. For example, if the tag width is made

gradually slender, the behavior of the page moving upward with the rotation can be represented.

FIG. 27 is a flowchart showing a process of expanding the tag during the semantic display. First of all, the tag

5   is on the semantic display (step S81). And if there is a pointer event near the tag display area, a tag being displayed is designated near the coordinate at which the pointer event occurs, for example, when a pointer 2A comes closer to the tag display area which is selectively

10   displayed. In an example of FIG. 28, the pointer indicated by reference sign 2A comes closer to a line tag indicating the 48th page among the line tags displayed and designates it. In this case, the lengths of the tag indicating the 48th page and its preceding or succeeding three or five

15   tags are reset to substantially as long as the tag length of current page and displayed (step S84 of expanding the tag). Then, the page information of the 48th page may be stored in the cache memory.

If there is no tag operation (step S85), the tag display

is restored after the elapse of a certain time (step S87).

On the other hand, if there is any operation on the expanded

tag displayed, the processing such as turning the page is

5   performed (step S86). A program for executing the

processing as shown in FIG. 27 may have a tag expanding

command for resetting the tag length displayed on the basis

of the relation between the tag displayed in the tag display

area and the coordinate or pressure of the pointer, and

10   a tag length return command for returning the tag length

resets to its original length after the elapse of a certain

time since the coordinate or pressure of the pointer returns

to the steady state.

Referring to FIG. 28, the tag expanding process will

15   be described again. A tag which is located closest to the

pointer 2A (tag of the 49th page in FIG. 28) when the

distance h between the tag and the input cursor is below

a certain distance H1, is drawn at a height inversely

proportional to the distance h with a gradually wider

interval between tags as the coordinate of an input cursor

comes closer to the tag (tag of the 49th page). When the

distance between the fingertip coordinate and the tag (tag

at the 49th page) is greater than a predetermined distance

5   H2, the change of the interval between tags as shown in

FIG. 28 gradually returns to a display state of FIG. 20,

after the elapse of a fixed time from exceeding it.

<Holding plural pages and tag display>

FIG. 29A is a view illustrating one example of the

10   display format of tag integral type. In the example as

shown in FIG. 29A, the turning state display data creating

step as designated at step A24 in FIG. 10 comprises a substep

of creating the turning state display data having a tag

portion along with the current page in the case where the

15   tag is appended to the current page. In the example as

shown in FIG. 29A, the display of compression type as shown

in FIG. 13A is effected along with a tag 74A appended to

the current page. Because of the compression type, the tag

width of the tag 74B in which the page is more compressed

is narrower than the tag width of the tag 74A.

FIG. 29B is a view illustrating one example of the

display format of plural pages integral type. In the

5   example as shown in FIG. 29B, the turning state display

data creating step A24 as shown in FIG. 10 comprises a

substep of deferring the transformation of each held page

until transformation of the current page for each of the

pages held in the case where the number of holding pages

10   detected in the page turning operation detecting step is

two or greater. In the example as shown in FIG. 29B, the

display format of slide type as shown in FIG. 12B is applied

for three consecutive pages consisting of a current page

75A displaying the character "A", a next page 75B of the

15   current page displaying the character "B", and a next

display page 75C displaying the character "C", wherein the

current page 75A and the next page 75B are transformed with

a time difference. Thereby, the next page 75B is displayed

while the page is being turned, whereby the state of turning

plural pages is seen more intuitively by the user. As shown

in FIG. 29B, in the case where a tag is appended to each

page, the tag may be moved along with each page.

FIG. 30 is a flowchart illustrating one example of a

5 tag display control in accordance with a holding operation

according to the fourth embodiment of the invention.

Referring to FIG. 30, the page information display method

comprises a page holding operation detecting step A31 of

outputting a page holding operation detecting signal, when

10 a predetermined page holding operation is performed at a

current page read from the electronic information memory

4 that is to be displayed at present, and a before-turning

holding object page tag coloring step A42 of coloring a

tag for a holding object page that is held by the page

15 holding operation with a different color from other tags

in one tag display area that is displaying a tag appended

to the current page, when the page holding operation is

initially detected in the page holding operation detecting

step A31. At this step A42, the tag of the page actually

held by the page holding operation is colored, whereby the user can confirm the effect on the number of holding pages by the holding operation due to the pressure or time at a glance. In particular, if the position of the page of

5   interest is roughly grasped from the position of page tag, the coloring of the tag is confirmed while the pressure is being changed minutely, thereby making the operation more correct and simpler.

And the page information display method further

10   comprises a next display page setting step A34 of setting a page having a page number that is equal to the current page added or subtracted by the amount of holding operation to a next display page to be displayed at the next time, when the page holding operation detecting signal is output

15   in the page holding operation detecting step A31, and a page turning process step A35 of displaying the next display page set in this next display page setting step A34 in place of the current page on the display unit.

In the example as shown in FIG. 30, the page information

display method further comprises, following the page

turning process step A35, an after-turning holding object

page tag coloring step A36 of coloring a page tag for the

5 holding object page, for which the page turning process

is completed, in the other tag display area where a tag

appended to a current page that has become the new current

page after the page turning process is not displayed, with

a different color from other tags.

10 The holding operation may be performed not only in the

information access area but also on the tag. FIG. 31 is

an explanatory view illustrating one example of the holding

operation on the tag. As shown in FIG. 31, holding plural

pages is effected by applying a predetermined pressure on

15 a tag 76 that has been expanded.

A holding display circle may be displayed on the tag.

In the examples as shown in FIGS. 32 and 33, the coloring

of tag by the holding operation and the display of the

holding display circle on the tag are employed at the same

time. Though in the example as shown in FIG. 31, the

succeeding pages of the current page, or the pages after

the expanded tag are only held, the preceding page can be

held if the same operation is performed in the tag display

5   area 6 at the preceding page. That is, the pages 77 held

in FIG. 32 are pages before the tag being operated currently.

On the other hand, in an example as shown in FIG. 33, the

pages 77 held are the pages after the tag being operated

currently.

10   FIG. 34 is a flowchart illustrating one example of the

tag display when an operation of turning plural pages

collectively is performed. In the example as shown in FIG.

34, the page information display method comprises a current

page tag height calculating step A41 of calculating a

15   display height of the current page tag on the basis of the

position of the current page with respect to the total

number of pages for the electronic information stored in

the storage unit 4, a succeeding page tag display format

designating step A42 of designating a display format of

the succeeding page tags on the basis of the tag height

of the current page tag calculated in the current page tag

height calculating step and the total number of succeeding

pages, and a preceding page tag display format designating

5   step A43 of designating a display format of the preceding

page tags on the basis of the tag height of the current

page tag and the total number of preceding pages before

or after the succeeding page tag display format designating

step.

10   Each of the display format designating steps A42, A43

may designate the display format in accordance with the

tag display method as described in the fourth embodiment.

That is, giving the highest priority to a position of the

current page tag height, the display format is determined

15   depending on the number of residual pages at this position.

And the page information display method further

comprises a page holding operation detecting step A44 of

outputting a page holding operation detecting signal, when

a predetermined page holding operation is performed at the

current page, a next display page setting step A45 of

setting a page having a page number that is equal to the

current page added or subtracted by the amount of holding

operation to a next display page to be displayed at the

5   next time, when the page holding operation detecting signal

is output in the page holding operation detecting step A44,

and page turning process steps A46 to A49 of displaying

the next display page set in the next display page setting

step in place of the current page on the display unit.

10   And in this page turning process step, first of all,

a page turning process is started (step S46). Subsequently,

the display control of the holding object page tag is made

(step A47). This display control step of the holding

object page tag comprises displaying the tags appended to

15   the current page that is to be turned and the holding object

pages that are held by the holding operation in the display

format in accordance with the page turning direction

specified in the preceding page tag display format

designating step A42 or the succeeding page tag display

format designating step A43 in the information access area,

while following the transformation or movement of the

current page in the current page turning step.

Subsequently, the page turning step is made (step A48).

5   Further, the display control step A47 of the holding object

page tag is repeated until the page turning process is

completed (step A49).

As shown in FIG. 35A, if the turning of plural pages

is executed in a state where the page tag is expanded, a

10   part for holding plural pages and the previous page

indicated by the fingertip involving the current page (i.e.,

the paper face) are turned collectively. At this time, in

a process example as shown in FIG. 34, the tag display of

a part indicated by reference numeral 79 in FIG. 35 is

15   effected in accordance with the display format in the tag

display area 6 for displaying the tag of the previous page

in a state where the drawing is inverted in a tag width

direction. That is, when the execution of the page turning

process is started, the next display page is treated as

the current page, and the tag height is recalculated to

redisplay the tag in the tag display area for the succeeding

page. And the tags appended to the pages from the current

page being moved by the page turning process to the last

5   page of the holding object pages are displayed in accordance

with the display format for the previous page, while

following the movement of the page turning process.

Also, in the example as shown in FIG. 35, the page

information display method further comprises, following

10   the page holding operation detecting step A44, a

before-turning holding object page tag coloring step of

coloring a tag for a holding object page that is held by

the page holding operation with a different color from other

tags in one tag display area that is displaying a tag

15   appended to the current page, when the page holding

operation is initially detected in the page holding

operation detecting step A44. For example, in the case where

a pressure circle according to the third embodiment is

displayed within the access area 5, the coloring of tags

for the held pages are changed, because it is considered

that the number of holding pages may not be grasped by simply

referring to the pressure circle.

FIG. 36 is an explanatory view for highlighting the

5   tag display in the information access area in the process

of turning plural pages collectively as shown in FIG. 34.

In an example as shown in FIG. 36, the holding object page

tag display control step A47 comprises a substep of setting

the tags appended to the current page that becomes the

10 turning process object and the holding object pages held

in the holding operation in a display format of equal and

close interval between tags. As indicated by reference

numeral 79B in FIG. 36, the tags are set in the display

format in which the interval between tags is close and equal,

15 the position of the current page after being turned can

be clarified promptly while the state of turning plural

pages collectively is displayed excellently.

FIG. 37 is an explanatory view illustrating a tag

display example after completion of turning plural page

collectively. In this example as shown in FIG. 37, the page

information display method further comprises, following

the page turning process step A49, an after-turning holding

object page tag coloring step of coloring a page tag for

5 the holding object page, for which the page turning process

is completed, in the other tag display area where a tag

appended to a current page that has become the new current

page after the page turning process is not displayed, with

a different color from other tags. Owing to the provision

10 of this after-turning holding object page tag coloring step,

the original position of page is apparently seen in the

case where plural pages are turned collectively, and

particularly as the position is visually memorized, the

original page is easily restored after turning pages with

15 the holding operation.

FIG. 38 is an explanatory view illustrating an example

in which a pressure circle is displayed over a tag, wherein

FIG. 38A is a view illustrating an example of a left page

tag, FIG. 38B is a view illustrating an example of a right

page tag, and FIG. 38C is a view illustrating an example

in which the tag coloring and the tag pressure circle are

employed at the same time. In the examples as shown in FIG.

38, the page information display method further comprises,

5 following the page holding operation detecting step A44,

a tag holding circle display step of displaying a circle

78 corresponding to the number of holding object pages in

the page holding operation over a tag for which the page

holding operation is detected, when the page holding

10 operation is initially detected in the page holding

operation detecting step A44. By displaying the holding

circle over the tag, it is possible to visually display

a difference from turning pages with a simple click.

FIG. 39 is an explanatory view illustrating an example

15 in which a holding object page is changed depending on an

operation direction upon the tag, wherein FIG. 39A is a

view illustrating one example of holding a previous page,

and FIG. 39B is a view illustrating one example of holding

a succeeding page. In the examples as shown in FIG. 39,

it is determined whether to hold the preceding page or the

succeeding page, depending on whether the fingertip is

moved upward or downward with reference to the time when

the plural pages turning operation is made effective by

5   the fingertip pointing to the page tag. The range for

moving the fingertip upward or downward is within one tag.

Hence, it is possible to distinguish this operation from

the continuous page turning by dragging the tag. And the

number of holding pages is determined in accordance with

10   the magnitude of pressure to execute the plural pages

turning operation.

Examples

The examples of this invention will be described below

with reference to the drawings. FIG. 40 is a block diagram

15   showing the configuration of hardware resources of this

example, which is common to the following examples. A page

information display device of this example comprises an

input unit 2 for inputting a pointer event and a storage

unit 4 for storing a variety of sorts of information, as

shown in FIG. 40. An output unit 49 is provided along with

a display manager 44 which is a display driver for

controlling this output unit 49 and a primary storage unit

46 for storing the image data of one screen or two screens

5   on the display unit. Also, the input unit 2 is provided

along with an access operation manager 45 for issuing an

access operation command to the display manager, on the

basis of a pointer event which has occurred in the input

unit 2, and a timer 48 for clocking the elapsed time during

10   this access operation.

The storage unit 4 stores the page information and the

tag displayed on a display 1, the electronic information

1A which is the page information of plural pages, the page

information 1B having the amount of information by which

15   the electronic information 1A can be displayed in the

information access area 5 in a unit of page, and a page

table 41 containing the configuration of this access

information 1B. The storage unit 4 has the electronic

information 1A stored in a universal file format such as

a text format, a word processor document format, an image

format, an HTML format, an XML format, a PDF format, or

a scanned image format. Of course, the electronic

information 1A described herein is available, even when

5   it is stored in a storage device at the remote location

which is connected via the telephone line or a network such

as LAN. Such electronic information 1A is converted into

a liner image file by a page converter 42 in this example.

For example, if the image data is one file for each page,

10   the display process can be facilitated. In this case, the

page information is in the image format which is a bit map

format, a TIFF format, a PICT format, a JPEG format, or

a GIF format. The page table 41 has index information in

which the tag content 18 such as page number corresponds

15   to the page information one to one. Since the page

information involves image information, the access

information is passed through the page converter 42 having

a copyright protection feature to embed an electronic

openwork. This process can be easily implemented on the

configuration of the page information display device.

Also, a page information manager 43 manages the data

structure or order of the access information 1B which is

then converted by the page converter 42 with reference to

5 the page table 41. In the example of displaying the

newspaper, more articles of information may be possibly

defined within one page of page information.

The page information display device in this example

comprises a high speed primary storage 46 for display, a

10 secondary storage 47 which functions as a prefetch cache

for display, and the page information manager 43 for

managing the predetermined page information to be read from

the storage unit 4 in accordance with the page being

displayed at present or the access operation and stored

15 in the secondary storage 47 These can improve the

responsibility to the access operation.

In order to transform into electronic data the

information which is conventionally printed on the paper

to enable access to the information intuitively, the input

unit 2 may be a device which enables the input operation

to be made, while simulating the sense of turning the page

of a book with a fingertip as faithfully as possible, such

as a touch panel, in this example. And the display 1 may

5   be a device enabling the display of high-resolution. It

is preferable that an input area of the input unit 2 covers

the tag display area 6, 7 of the display 1, thereby providing

the input area and the tag display area 6, 7 integrally.

Of course, with a computer configuration as shown in FIG.

10   65, the access of electronic information is enabled

sufficiently. This does not necessarily mean that the

touch panel or the high resolution output device must be

used.

FIGS. 40 and 41 are flowcharts showing the outline of

15   the operation in this example. Firstly, to check the cache

capacity, the page information manager 43 confirms the

capacity of the secondary storage 47 (step S21).

Subsequently, the page information manager 43 confirms the

presence or absence of the electronic information 1A and

the page table 41 (step S22). The page information manager

43 manages the page converter to convert the electronic

information 1A into the page information 1B, when the

electronic information 1A exists in the storage unit 4 and

5 the page table 41 does not exist in the storage 4. In this

case, the page converter 42 firstly checks the file format

of the electronic information 1A (step S23). The amount

of information which can be displayed in the information

access area 5 is automatically converted into the page

10 information in a unit of page (step S24). This conversion

process will be described later in detail as the related

art. Then, the page information manager 43 determines the

tag content 18 such as page number for the page information

in the order of creating the page information, and registers

15 the electronic information 1A as the page information in

the page table 41 (step S25).

At step S24, the electronic information 1A in

different file formats is made accessible as one book having

a linear information structure. The page table 41 can be

rewritten and changed without departing from the linear

information structure accessible in this example.

In this example, the access information to be

displayed on the display 1 is stored in the primary storage

5   46 which has the highest speed in reading or writing the

information. Also, the secondary storage 47 having a

higher speed in reading and writing the information than

the storage unit 4 has stored the access information for

the user to access at the next time. Therefore, if the page

10   to be displayed by the access operation is determined, the

page table 41 is referred to (step S26). A page to be

displayed is stored in the primary storage 46 (step S27).

The previous and next pages are stored in the secondary

storage 47 (step S28). This is to enable the high-speed

15   display by transferring the page information from the

secondary storage 47 to the primary storage 46, when the

page information requested by the display manager 44 is

in the secondary storage 47. If the page information

requested by the display manager 44 is not present in the

secondary storage 47, the page information is taken from the access information in the storage unit 4 and stored in the primary storage 46.

As shown in FIG. 42, the tag 8, 9, 10 appendant to the page is drawn in the tag display area (step S31). And the page information stored in the primary storage 46 is displayed in the information access area 5. Subsequently, the procedure waits for an input into the input unit 3 such as a touch panel (step S33).

If an access operation such as turning the page is applied to the input unit 3, the access operation manager 45 judges the content of operation to pass the sort of access to the display manager 44 (step S34). The sorts of access may include, for example, turning the page one after another, switching promptly from the accessed page to another page, turning the pages in a certain range roughly, and displaying only the desired article contained in the electronic information over the entire access area in full.

If the sort of access is passed to the display manager 44, the page information to be displayed in the information access area 5 is determined from the sort of access. For example, when there is a request to the page information manager 43 of storing the access information to be displayed in the primary storage 46, another page information for the user to access newly at the next time is retrieved from the storage unit 4 and stored in the secondary storage 47, if the access information stored in the primary storage 46 can be passed from the secondary storage 47 (step S35).

The secondary storage 47 should store more succeeding pages of the currently displayed page, thereby resulting in higher hit rate because the access is typically made in an ascending direction of page number. When there is a pointer event such as expanding the tag, as will be described later, the page subjected to tag expansion may be read beforehand, and stored in the secondary storage 47.

First example

In the above example, the page information having a

size of one page is a minimum unit of data. On the contrary,

in the case where an entire paper face of the newspaper

is displayed, or where a magazine article is displayed,

5   each article may be displayed in enlargement. This may be

done by enlarging the information of a book or the like,

or the illustration in the book. Such enlargement may be

performed in such a way as to create beforehand the page

information itself at high resolution and enlarge the page

10   information that is the image data, or create and enlarge

for displaying the page information in the vector data of

a text or diagram. In the case where the enlarged display

of the article is made, the length of the current page tag

should be set to several times the normal length. Thus,

15   it is possible to recognize intuitively any article in the

electronic information being enlarged, for example, with

reference to the shape of tag.

In the case where the article information is provided,

the page information may have the article information

expressly defined with the scope of coordinates for the

article information in the page information. In the case

where the user points to the page information with the

fingertip, using the operation unit (input unit) 2, if the

5   coordinate values indicated by the fingertip are contained

within the scope of coordinates, the article information

corresponding to the scope of coordinates is displayed on

the display 1. Also, the scope of coordinates for this

article information becomes data which does not depend on

10   the device, if it is defined in terms of the ratio of the

article information relative to the length of the page

information.

FIG. 43 is a flowchart illustrating a process example

for displaying in enlargement the article information in

15   the first example. As shown in FIG. 43, the page

information display method of this example comprises an

article information enlarging operation detecting step A51

of outputting an article information enlarging operation

detecting signal having the positional information as to

an article information enlarging operation, when the

article information enlarging operation is detected on the

operation unit, in the case where plural articles of

information making up a current page are defined in the

5   current page read from the storage unit 4 that is to be

displayed at present, and an article information enlarging

display step A52 of displaying in enlargement the article

information at a position indicated by the positional

information on the display unit, in the case where the

10   article information enlarging operation detecting signal

is output in the article information enlarging operation

detecting step A51. By allowing for the enlargement of the

article information, the article information can be

accessed or read more clearly, for example, in the case

15   where the newspaper information is involved in the

electronic information. The article information

enlarging operation detecting step A51 further comprises

a substep of outputting an article information enlarging

operation detecting signal including a click position as

the positional information, for example, when a click is made on the operation unit 1C. That is, by clicking on the article information to be read, that article information can be enlarged.

In the example as shown in FIG. 43, the page information display method further comprises, following the article information enlarging display step A52, an article display page turning inhibit control step A53 of inhibiting a normal page turning operation while the article information is being displayed in enlargement. If the page turning operation is enabled while the article information is displayed in enlargement, a linear structure of the page information in which the page number is incremented one by one is broken, and it is apprehended that the user is confused. That is, if the access is permitted by turning pages while the article information is being displayed, the page information gets rid of the linear information structure, because the information structure is branched at that time. As a result, it is difficult for the user

to reconstruct the information structure easily.

Therefore, in a preferred embodiment, the page turning

process during the display of article is inhibited.

Accordingly, all the operations that are performed during

5   the display of article are interpreted as the operation

of restoring the page information having that article

information to the original state.

FIG. 44 is an explanatory view illustrating an example

of effecting the continuous enlargement operation by

10   dragging plural articles. In this example of continuously

enlarging plural articles, the article information

enlarging operation detecting step A51 further comprises

an article information continuous enlarging operation

detecting substep of outputting an article information

15   continuous enlarging operation detecting signal in the

case where two or more articles of information is contained

in a locus of dragging, when a dragging is made on the

operation unit. And the article information enlarging

display step A52 may comprise a continuous enlarging

display substep of displaying in enlargement the article

information individually in time series at every

predetermined time interval in the order of the dragging,

in the case where the article information continuous

5   enlarging operation detecting signal is output. The

continuous enlarging display step may comprise a substep

of displaying in enlargement the two or more articles of

information in time series continuously at a time interval

in accordance with a rate of the dragging, for example.

10   As shown in FIG. 44, the page information (fourth page)

having articles of information 82A, 82B, 82C, 82D is

displayed as the current page. At this time, when a

dragging is made along an arrow indicated by reference

numeral 82F, this operation is judged as the article

15   information continuous enlarging operation. In this case,

the continuous enlarging display step involves first

displaying the article information as indicated by

reference numeral 82A, and after the elapse of a certain

access time, or upon an article information reduction

instruction (e.g., a click on the enlarged article

information of the touch panel), displaying the next

article information 82B and then the article information

82C. By enabling this article information continuous

5   enlarging operation, the article information can be

steadily perused consecutively after the operation.

Therefore, the operability can be enhanced without making

the interface complex.

FIG. 45 is an explanatory view illustrating one

10   example of displaying in enlargement the article with a

wire frame. In the example as shown in FIG. 45, the article

information enlarging display step A52 comprises an

enlarging time wire frame display substep of enabling a

wire frame, with a start region at an outside periphery

15   of the article information to be enlarged, to be displayed

at multiple stages of varying sizes up to an outside

periphery of the display unit. In the example as shown in

FIG. 45, when the wire frame display is made, a wire frame

as large as surrounding the article information is

displayed. Subsequently, a plurality of wire frames are

created at the same aspect ratio for the outside periphery

of this wire frame and the outside periphery of the

information access area 5. And the wire frames are

5   displayed in succession from the wire frame surrounding

the article information to the outside periphery of the

information access area 5. By displaying the wire frames,

the enlargement of the article information is made apparent,

and the user can recognize visually in which region the

10   article information is located before enlargement.

The page information display method may further

comprises, following the article information enlarging

display step A52, a reducing time wire frame display step

of enabling a wire frame, with a start region at an outside

15   periphery of the display unit, to be displayed at multiple

stages of varying sizes up to an outside peripheral position

of the article information at the current page, when an

enlargement completing operation for completing the

enlargement of the article information is performed. Then,

where the article information enlarged currently was located in the page information can be displayed excellently.

To enlarging the article information more clearly, the
5   article information may be once embossed, and then enlarged.
Also, the article information itself may be drawn while being enlarged physically, instead of the wire frame display. FIG. 46 is an explanatory view illustrating one example of enlarging the article information after
10 embossing it. In the example as shown in FIG. 46, the article information enlarging display step comprises a substep of embossing an article chosen from the current page.

FIG. 46A is a view illustrating a state in which an
15 article is shaded for embossing, FIG. 46B is a view illustrating a state in which a selected article is being enlarged, and FIG. 46C is a view illustrating a state after the enlargement process is completed. Herein, an embossing process is implemented by applying the article

information 84 with a shade 85. Also, the reduced article

data to be embossed may be superposed on the page

information. By cutting and displaying an image of the

article data from the paper face data, an embossed portion

5   may be replaced with the article data, when the enlargement

of the article is ended.

FIG. 47 is an explanatory view illustrating one

example of a tag display when the article information is

enlarged. In the example as shown in FIG. 47, the article

10   information enlarging display step A52 comprises an

enlarged tag appending step of enlarging a tag as well as

appending the enlarged tag to the enlarged article

information, in the case where the current page has the

tag. In the example as shown in FIG. 47, to make clear

15   whether the page information is displayed over the paper

face, or the article information is displayed in detail,

the appearance of the tag is changed. Thereby, the

transfer of the access state by the access operation can

be presented to the user. For example, when the article

information is displayed in enlargement, a tag 8A appendant

to the page information containing that article

information is enlarged. In this way, the tag is displayed

in enlargement along with the article information to

5   clarify that the article information is being access in

enlargement.

FIG. 48 is a diagram illustrating one example of an

article information table which lists in correspondence

the page information and the article information. A way

10   of storing the article information may include enlarging

part of the page information by having the page information

of high resolution and referring to the range of coordinates

for the article information. In this case, the presence

or absence of the article information and the designation

15   are defined in each page information, and the range of

coordinates is determined for each article information,

as shown in FIG. 48. This article information table is

stored in the storage unit 4 to enlarge the article

information.

Second example

In a second example, a process of turning pages for the page information upon a pointer event will be described below. This second example involves an even driven type

5 page turning process. And various kinds of the page turning process are realized employing an operation on the tag and an operation on the page information (information access area).

<Page-turning operation with tag>

10 The tag display as shown in FIG. 16 or 20 is through an interface which is not only superior in the respect of allowing the user to intuitively know the total page number of electronic information or the position of current page relative to the total page number of electronic information,

15 but also favorable as a tool to allow the user to display a desired page from among a plurality of pages defined linearly. In this example, there is provided an interface in which an operation of turning the page for a book is a metaphor, and using a tag which is considered to be an

artificial presence, the operation can be intuitively

understood, irrespective of the computer experiences.

In this example, a pointer driven interface is adopted.

The pointer may be a fingertip or a pen-type pointer, for

5   the use of a touch panel display 49, or a mouse 105 or an

arrow operated by the arrow key of a keyboard 104 and

displayed on the screed, for the use of a CRT connected

to a computer 100. To prompt the user for intuitive

understanding, the touch panel is desirable.

10   There are roughly four ways of turning the page for

a book, including turning one page after another to read,

turning the pages quickly while searching for a key word,

opening a predetermined page by referring to the page number,

and turning plural pages at once forcefully.   When turning

15   the pages quickly, the pages may be turned by the use of

elasticity of paper, with the end portion of pages pressed,

without displaying the entire page.   To make these

operations metaphoric, various pointer events to the tag

are used.

One access means of switching promptly from one page

being accessed to another page to access is a click of tag.

The sheets may be brushed at the side edge in turning the

page for the book. The similar operation is conducted by

5   the click of tag. The user directly touches the tag 8, 9,

10 of the page which the user wants to access, so that the

page information corresponding to the tag content 18 such

as page number of the designated tag 8, 9, 10 is displayed

in the information access area 5, as desired, while the

10   behavior of turning the page is displayed visually. In a

case where there occurs a pointer down within the tag, and

a pointer up within the same tag, the page with the tag

appended may be turned.

One access means of turning the pages sporadically in

15   a certain range of pages roughly involves touching the tag

with a fingertip and keeping the fingertip away from the

tag consecutively, while tracing with the fingertip plural

tags appendant to the page information desired to read by

turning the pages, so that each page information is

displayed in the order of touching the tag in the

information access area 5, with a constant display interval

and consecutively. Then, the timer 48 measures the time

until plural tags have been touched. At a display rate

5   proportional to the measuring time, the page information

can be displayed in succession. In practice, when turning

the pages sporadically, the sheets to be turned are turned

over, with the side edge of the sheets pressed. In the same

way, the tags are consecutively pointed down, to effect

10   the turning of the pages in succession.

Referring to FIGS. 49 and 50, a pointer event driven

interface will be described below in detail. FIG. 49 is

a flowchart showing a process in the second example of the

present invention. First, a current page is displayed

15   (step S91). Each tag is also displayed in the normal

display mode or the semantic display mode (step S92 of

displaying the tag). Then, the procedure waits for a

pointer event (step S93). If there occurs a pointer event,

a page turning operation is performed in accordance with

the sort of event (step S94 of controlling the even driven display).

FIG. 50 shows the relation between the pointer event and the page turning process. First, when a certain tag

5 is dragged, a dragged page is moved gradually as shown in FIG. 26, and the next page of that tag is displayed (page turning step). Then, the page may be moved along with the tag appended. Also, when a certain tag is clicked, a page indicated by the clicked tag is displayed. If there is a

10 difference between the pointer down position and the pointer up position within the same tag, that difference being above a predetermined threshold in the page turning direction, the next page of that tag may be displayed.

In a case where a tag is dragged over plural tags, that

15 is, there occurs a pointer down at a certain tag and then a pointer is moved in the tag display direction without pointer up, then the pointer is up at another tag, the pages indicated by the dragged tag are displayed successively in the order of being dragged. If the pointer down time

or pressure is beyond a predetermined threshold in the tag

or the information access area near the tag, a plurality

of pages may be moved at a time, supposing that the number

of sheets in accordance with the time or pressure are seized.

5   Then, the tag being seized may be moved dynamically to the

neighborhood of the pointer in accordance with the

variation in time or pressure.

In the page information display device for performing

such page turning operation, the access operation manager

10   45 may be provided with an event driven display controller.

Each operation as shown in FIG. 50 can be also implemented

by the CPU which executes the program. In this case, a

method for each pointer event may rely on the use of a

program which defines each operation.

15   <Event in the information access area>

Referring to FIG. 50 again, in the case where the time

or pressure of pointer down is equal to or greater than

a certain value, the process of holding plural pages is

common on the tag and the page information. The process

of turning the page by dragging in the direction of turning

the page is a pointer event for the page information. Also,

the operation for the page information may involve clicking

on the article information or dragging plural articles.

5   A drag to turn the page and a drag to effect the

continuous enlargement of the article can be discriminated

in accordance with the locus of dragging. FIG. 51 is an

explanatory view illustrating one example of a process for

selecting one of the page turning and the continuous display

10   of article information in a locus of dragging. In the

example as shown in FIG. 51, an event driven display control

portion comprises a page selection function for each locus

direction for selecting a page having a smaller page number

or a larger page number than that of a page being displayed

15   at present on the basis of the locus of pointer from the

pointer down to up. Also, the event driven display control

portion may have an article continuous display function

of continuously displaying in enlargement the article

information overlapped on a path of the locus on the basis

of the path of the locus.

FIG. 51A is a view illustrating the locus on the

straight line, and FIG. 51B is a view illustrating the locus

5   having a curve.   As shown in FIG. 51A, for a locus 86 of

the straight line extending beyond a predetermined area

R, the page turning process is determined.   On the other

hand, for a locus 87 that is curved, the selection of the

article information is determined, as shown in FIG. 51B.

10   In this way, the tag is designated, or an operation

is performed on the page information in this example,

whereby it is possible to access the electronic information

at any page by changing the display rapidly from the page

being accessed to the electronic information at that page.

15   Hence, the user can switch the page information in an easy

manner.

Third example

In a third example, a process of prefetching the page

information will be disclosed below.   Typically, the page

information may be read sequentially one page after another

with high possibility. Therefore, it is conceived that

plural pages following the current page are prefetched and

stored in a VRAM (primary storage) 46 or a cache memory

5   (secondary storage) 27. However, since plural pages are

turned in the embodiment, the measures taken will be

described below.

FIG. 52 is a flowchart illustrating an operation of

this example. In the example as shown in FIG. 52, a current

10   page A is displayed (step A56). And a page turning

operation is identified (step A57). Then it is confirmed

whether or not turning plural pages is valid (step A58).

In the case of turning plural pages, the pressure is

measured (step A59), and the number of pages corresponding

15   to the pressure is calculated (step S60). And from the

current page A and the number of holding pages N, a next

page C to be displayed at the next time is determined if

the turning operation is made at this time (step A61).

And it is checked to see whether or not there is a sufficient capacity to secure the page C in the VRAM (step A62). IF there is less sufficient capacity in the VRAM, the page B which has resided in the VRAM for the longest time is abrogated (step A63). At this time, the page number Bn of the abrogated page B is memorized. On the other hand, if the VRAM has a sufficient capacity to memorize the page C, the page C is stored in the VRAM (step A64).

If the page turning operation is actually performed, the page C is set to the current page (step A67), and the following step is performed (step A68). On the other hand, if there is no page turning operation, turning plural pages has been cancelled, whereby the page C is deleted from the VRAM, and the page B is stored again in the VRAM (step A65).

FIG. 53 is an explanatory view illustrating one example of a state of turning plural pages collectively. As shown in FIG. 53, in the page information display device of this example, the display controller 3 comprises a cache memory (secondary storage) 47 for memorizing temporarily

the page information that is judged to be displayed on the touch panel among the electronic information stored in the electronic information memory 4, a continuous page prefetch control portion 3B for storing in advance the page

5 information having a page number following the page number of the current page being displayed at present on the touch panel in the cache memory, and a page turning process control portion 62 for effecting a page turning process by selecting one or more pages in accordance with an

10 operation on the touch panel 1. And the continuous page prefetch control portion 3B has a plural pages-turning time deleting function 3D of deleting the page data in the plural pages from the cache memory 47, in the case where a page turning operation of plural pages is detected by the page

15 turning process control portion 62.

The continuous prefetch control portion 3B prefetches plural pages following the current page from the storage unit 4 and stores them in the secondary storage 47. On the other hand, the plural pages turning time deleting function

3D is to delete the page data in plural pages from the cache

memory 47, if the operation of turning plural pages is

detected by the page turning process control portion 62.

The data skipped by turning plural pages is deleted from

5   the cache memory 47 to make effective use of the capacity

of the cache memory.

     In the example of dealing with the article information,

the display controller 3 may comprise an article

information prefetch control portion for storing the

10   article information within the current page in the cache

memory if the current page contains the article information.

FIG. 54 is an explanatory view illustrating an example for

memorizing the page information of high resolution. In the

example as shown in FIG. 54, the individual article data

15   is produced from the data of one page. In this example,

the article information prefetch control portion creates

beforehand the article information while the current page

is being displayed, and stores it in the cache memory or

VRAM. FIG. 55 is an explanatory view illustrating an

example of memorizing the page information and the article

information separately. In this case, the article

information prefetch control portion reads the individual

article information from the storage unit 4, and stores

5   it in the VRAM 46.

Fourth example

A method of creating the page information accessible

by the page information display device from the electronic

information 1A stored in the storage unit 4 will be

10   specifically described below. The above page information

display device has a capability of access in a universal

file format widely used for the electronic information,

such as a text format, an image format, an HTML format,

an XML format, or a PDF format. Therefore, when the linear

15   information structure of access information is defined,

it is desirable that each file format has an information

structure in view of the information in a unit of page such

as a book. However, as for the specific information

structure of each file format, it is presumed that its

specific structure can be recognized by the page

information display device. The reason is that the page

information display device is not intended to analyze the

specific structure to each file format as its main purpose,

5   and it is generally considered that the information

structure can be easily analyzed from the file format as

the conventional art.

The universal file formats widely used as the

electronic information can be classified into four

10   categories, depending on the information structure. A

first category is typically a text format of information

structure. The feature is that the length of one line of

sentence, or the size or kind of font, is not defined, and

the number of lines is not defined like a rolled book having

15   no unit of page. Therefore, to gain access in a unit of

page on the page information display device, the size or

kind of font is first defined to determine the amount of

information contained in one page. Consequently, the page

screen image can be determined, and stored in the storage

unit as the access information, which can be accessed on

the page information display device.

A second category is an image format of information,

such as a bit map format, a TIFF format, a PICT format,

5   a JPEG format, or a GIF format. The page information

display device creates the access information having the

image size translated so that the image format of

information may be fully contained in the access area.

Then, the information of the image format is divided by

10   the size of the information access area to create the

article information. And the access information and the

article information are registered in the page table to

enable access with the page information display device.

A third category is typically an HTML format or an XML

15   format of information structure. In order to gain access

to these file formats in the page information display device,

it is necessary to create a page table corresponding to

a hyperlink structure and a frame (means for displaying

the electronic information in respective areas of divided

display screen). First of all, a conversion method of the

hyperlink structure in the page information display device

will be described below. The hyperlink structure allows

the file on the Internet to be set at the link destination.

5   Therefore, for all the information of HTML format or XML

format, it is of no use to define the linear information

structure by automatically looping the link destination,

because the number of pages is increased without limit.

Therefore, the page information display device creates the

10   access information only for the electronic information

present within the same domain of electronic information

to translate the information in the HTML format or XML

format into the linear information structure. If the link

destination is outside the same domain, the electronic

15   information is ignored in the process of creating the linear

information structure.

A fourth category is a PDF format (manufactured by

Adobe: a file format accessible by AcrobatReader) of

information structure. Since the electronic information

of the PDF format is in a unit of page, the page information

display device makes direct use of the electronic

information of the PDF format in the given page order. The

access information is created by transforming the image

5   information of each page in the electronic information of

the PDF format into the size which can be displayed in the

access area. When the electronic information of the PDF

format has the link structure, the link is ignored to secure

the linear information structure, thereby making it

10   possible to gain access to the information structure of

the PDF format.

Generally, it is desirable that the data in any of

various formats is once transformed into the image data.

To handle the access information as the image information,

15   the third party is not allowed to easily alter the content,

and the electronic papermark can be readily embedded into

the access information according to the conventional art.

Also, the access information can be readily applied on the

surface of a virtual object as the texture information.

FIG. 56 is a block diagram illustrating a

configuration of the page information processing unit that

converts the ML data in the fourth example of the invention.

In the example as shown in FIG. 56, a page information

5   display device comprises reception means 93 for receiving

the ML data described in a make-up language via a

communication line from a server, ML data conversion means

94 for converting the ML data received by the reception

means 93 into the image data in a unit of page of

10   predetermined size, an electronic information memory 4 for

memorizing the page information that is the image data

converted by the ML data conversion means 94, a touch panel

1 for displaying the page information stored in this

electronic information memory 4 as well as inputting an

15   operation to gain access to the page information, and a

display controller 3 for controlling the display of the

page information stored in the electronic information

memory on the basis of an operation content input into the

touch panel 1.

And the ML data conversion means 94 comprises a page number appending portion 95 for converting a link structure of the ML data into one dimensional book structure as well as appending sequentially the page number to the page

5 information after conversion. Further, the display controller 3 comprises an event driven display control portion 97 for selecting the page information of a page having a smaller page number or a larger page number than that of a page being displayed at present on the touch panel

10 as a next page to be displayed at the next time on the basis of a locus from the pointer down to up on the touch panel.

In the example as shown in FIG. 56, the page data described in the make-up language and having the link structure that is the third data format is converted into

15 the linear structure that can be dealt with in this example. FIG. 57 is an explanatory view illustrating one example of the link structure of an ML page, wherein FIG. 57A is a view illustrating one example of the link structure, and FIG. 57B is a view illustrating an example in which the

link structure is transformed into the book structure. In the case where the pages N2 to N7 are defined in three hierarchies C1, C2 and C3 from a home page N1 that is a route, these pages can not be directly treated as the page

5   information in this embodiment.

In this example, in the case where the specific ML data is specified in URL, the ML data within its domain is downloaded, and then converted into the book structure. Within a single domain, it is possible to prevent the

10   infinite number of pages from being downloaded by the hyperlink. The page number appending portion 95 converts the link structure of the ML data into the one-dimensional book structure and appends sequentially the page number to the page information after conversion. And the ML data

15   converting means 94 converts the ML data of the structure as shown in FIG. 57 into the image data in the unit of page of predetermined size.

This page number appending portion 95 converts the ML data into the book structure having the linear structure.

Because each page is appended with the page number, the operation of turning one page, appending the tag, or holding plural pages is enabled.

In the example as shown in FIG. 57, a link structure

5   200 as shown in FIG. 57A is translated into the structure as shown in FIG. 57B. Specifically, the ML pages N2, N3, N4 linked under the ML page N1 are arranged in the order of link. Similarly, the ML pages N5, N6, N7 linked under ML the pages N2, N3 are arranged in the order of link under

10   the ML information N2, N3 to be linked. By repeating this scan, the structure as shown in FIG. 57B is produced.

The ML data conversion means may comprise a tree structure converting portion 96 for designating a single tree structure from the link structure 200 of the ML data

15   as well as converting the tree into a one-dimensional book structure by searching the tree in a predetermined search order. This tree structure converting portion 96 searches the link structure of the ML data, giving priority to the depth in the example as shown in FIG. 57. Also, it may

search the link structure, giving priority to the width.

In the case where the depth is given priority, the preorder

scan may be effected outputting from the side closer to

the route of tree.

5   FIG. 58 is an explanatory view illustrating another

example of the link structure of the ML page. In this

example, in the case where one ML page N7 has links L37

and L47 with two or more ML pages present at an upper

hierarchy C2, a link L37 with the ML information N3 having

10   a smaller page number at the hierarchy C2 is made effective,

and a link L47 with the page information N4 is ignored.

Also, in the case where the link L23, L67 exists at the

same hierarchy C2, C3, as shown in FIG. 59, these links

are all ignored. In the case where the file of HTML format

15.   with a frame defined is the page information, the frame

which is a heading for other pages is placed at the upper

hierarchy, and the above process is performed.

In the case where the page information is accessed

while the ML page is converted, the display controller 3

comprises a tag appending portion 98 for appending a tag

indicating a page number of the page information to both

end portions of the touch panel 1, the tag appending portion

having a converted page tag display function of displaying

5   the tag for the page having the page number appended by

the page number appending portion on the touch panel. Then,

the position and amount of page information accessible

after conversion can be clear.

In the above example, the information provided via the

10   Internet can be accessed with a simple operation.

Fifth example

FIG. 60 is a block diagram illustrating a

configuration of a page information display device for

controlling the tag display at the time of streaming in

15   a fifth example of the invention. As shown in FIG. 60, the

page information display device comprises reception means

93 for receiving the page information via a network 91 from

a server 90, an electronic information memory 4 for

memorizing the page information being received by this

reception means 93, a touch panel 1 for displaying the page

information stored in the electronic information memory

4 as well as inputting an operation to gain access to the

page information, and a display controller 3 for

5   controlling the display of the page information stored in

the electronic information memory on the basis of an

operation content input into the touch panel 1.

And the display controller 3 comprises a tag appending

portion 98 for displaying a tag indicating the content of

10   the page information stored in the electronic information

memory on the touch panel, and a streaming time dynamic

tag appending control portion 99A for operating the tag

appending portion as the page information is being received

by the reception means. Since the tag appending control

15   portion 99A appends the tag to the page information

downloaded, the user can grasp to which page the page

information has been downloaded while perusing the current

page.

Also, the display controller 3 may comprise a

streaming time dynamic tag coloring control portion 99B

for coloring a tag which has been received with a different

color from the tags which have not been received, as the

5   page information is being received by the reception means

93, and a streaming time dynamic tag length control portion

99C for enabling the tag appending portion to create a tag

having a length corresponding to the amount of information

already received in one page of the page information as

10   the page information is being received by the reception

means 93.

FIG. 61 is a view illustrating an example of

controlling the tag display in accordance with the amount

of downloaded data in the configuration as shown in FIG.

15   60, wherein FIG. 61A is a view illustrating an example of

displaying the tag for the page which has been completely

downloaded, and FIG. 61B is a view illustrating an example

of setting the tag for the page being downloaded to the

tag length in accordance with the downloaded volume. In

this example, when the streaming technique is utilized,

the operation is controlled such that in the portion where

the display page is not preserved locally, the tag is not

displayed. The user is notified that the page can not be

5   accessed by displaying no tag.

In the example as shown in FIG. 61A, the pages up to

the sixth page have been downloaded. In the example as

shown in FIG. 61B, if the page data has not been downloaded,

the length of tag is shortened. To indicate that the

10   enlarging operation is not allowed, the data being

downloaded may be interlace displayed.

FIG. 62 is a view illustrating an example of

controlling the tag display in accordance with the amount

of downloaded data in all pages in the configuration as

15   shown in FIG. 60, wherein FIG. 62A is a view illustrating

an example of normally displaying the page tag only, and

FIG. 62B is a view illustrating an example of normally

displaying the page tag by the length of tag in accordance

with the volume of one page that has been downloaded. If

the total number of pages in the object (contents) to be

downloaded can be first confirmed on the main system side,

the page tags corresponding to the total number of pages

are drawn, and the page tag of the downloaded page is

5   displayed with the number, as shown in FIG. 62A. For

example, for the page data that has not been downloaded,

the page number is not displayed so as to clearly

distinguish it from the page tag of downloaded page, or

the page tag is colored with a different color from the

10   page tag of downloaded page.

In the example as shown in FIG. 62B, in the case where

70% is downloaded, for example, the page tag is displayed

70% in color like a bar graph, whereby a downloaded state

of the data by streaming is visualized. As described above,

15   the streaming technique is employed by providing the

restriction that the page not downloaded (0%) can not be

accessed.

And in the example as shown in FIG. 62B, the seventh

page is being downloaded. Since the seventh page has been

downloaded by 70%, it is indicated that the bottom side

of the page tag (shaped like a trapezoid) is displayed by

70%. Namely, the size of page tag is changed in accordance

with the downloaded volume so as to visualize the downloaded

5   volume by streaming clearly.

In this application of the streaming technique, it is

presumed that the data of a linear book structure is

downloaded. However, the data conversion may be made into

the predetermined data format in the same way as in the

10   fourth example. In this case, the display of tag may be

made depending on whether the page data is converted or

not.

Sixth example

In a sixth example, various operation contents are

15   stored as a history to make up for a delay of the system

response when the user is skilled in the operation. FIG.

63 is an explanatory view illustrating an example of

handling the history information in the sixth example of

the invention, wherein FIG. 63A is a view illustrating one

example of the history information in which the commands

for limited operations are memorized, and FIG. 63B is a

view illustrating one example of the history information

in which the commands for all operations are memorized.

5   As shown in FIG. 63, the operation history is described

in the history information. In the example as shown in FIG.

63A, since the operation history memorized serves as a

supplementary function when the drawing method of the

system can not be followed, a complex page turning operation

10   (e.g., a direct page turning operation or a continuous page

turning operation) wherein the operation and the drawing

can not be synchronized well, and an operation (e.g.,

enlargement or reduction) that is not performed before the

drawing is completed may not be described in the history

15   information to avoid the divergence of the operation.

In the example as shown in FIG. 63B, all the operation

events are stored in the history information. In a simple

page turning operation (sequential page turning operation),

if there is a more delay time between the operation and

the drawing, the operation is so divergent that the user

may be confused. Hence, the number of saving the operation

history should be limited to avoid the divergence (i.e.,

inconsistency behavior between the user's operation image

5   and the system behavior) of the operation. For example,

the event description characters of the sequential page

turning operation are sequentially described directly from

the top on a history file. And an event is processed

sequentially from the top, and if processed, its operation

10   event is deleted from the history file. FIG. 64 is a

flowchart illustrating an example of processing an

operation thread and a drawing thread independently. At

step A75, the operation and the drawing are connected.

     Comparative example

15   Some advantages of the embodiments and examples as

described above will be described below by comparison with

the conventional example. A special display of touch panel

type as shown in FIG. 15 is not used, but the computer as

shown in FIG. 65 is used to gain access to the page

information. However, a computer 100 is a machine having

a display unit 102 and a main unit 103. Hence, the user

layer who can operate an electronic oven but is not good

at reservations of the video program may have an impression

5　of difficulties of operation. In particular, the

operation by a keyboard 104 or a mouse 105 is troublesome

in the respect of simply accessing the information, as

compared with the device as shown in FIG. 15.

Further, when the electronic information provided in

10　the computer is accessed, as opposed to accessing the paper

information, the user is required to become skillful in

the operations specific to the conventional graphical user

interface, using an input unit such as keyboard 104 or mouse

105. Therefore, for example, the user is obliged to

15　perform the operations which is greatly different from a

routine work of turning the page such as when the book is

read. In particular, it is difficult for the user

unfamiliar with the computer to easily gain access to the

electronic information.

The operation method specific to the conventional

graphical user interface as described herein is to operate

a virtual input device which is abstractly displayed on

the output unit of the computer, using an input cursor which

5   can be operated by the mouse. The virtual input device

means, for example, a scroll bar 303, a pop-up menu 304,

and pages 301, 302 or the like of thumbnail representation

displayed on the output unit of the computer as shown in

FIG. 66.

10   As shown in FIG. 66, the electronic information of one

page is displayed on the same screen, including the next

page, depending on the size of the display and the amount

of electronic information. This is moved by using the

scroll bar 303, or the page is moved by using the thumbnail.

15 However, since the scroll bar is artificial and never used

in the practical access of books, it is necessary to become

skillful in operating appropriately the direction or size.

On the contrary, the present invention makes use of

the tag. When the tag is appended to the page of

information side by side, most users may recall the label

attached to the book. Therefore, it is sufficiently

expected that the user is informed to use the tag when the

user wants to move the page without any teaching. Further,

5   the total amount of page information can not be known

intuitively, depending on the state of the scroll bar. On

the other hand, in the above examples, the total amount

of page information can be grasped at a glance owing to

the tags appended to all the pages. And in the example

10   where the tags are arranged on the left and right sides

around the current page, the position of the current page

relative to the total pages can be considerably made clearer

than the conventional example as shown in FIG. 66.

It is common that the conventional tag for use with

15   the paper or computer has a heading for plainly representing

the content of information described in the page. This

heading is plainly symbolic of the information extending

over plural pages in most cases. Taking a quick look at

the tags with the heading, it is not possible to know easily

the heading designates the information from what page to

what page. Since the heading information is typically

composed of words or phrases, the heading information

having too great number of characters is difficult to be

5   attached to the tag. In such a case of attaching the

heading to the tag with difficulty, the character size of

the heading is reduced, or the characters to be written

out of the tag are omitted. However, it is considered that

the tag to be displayed in this situation does not exactly

10   fulfill duties for the graphical user interface. On the

other hand, in the examples of the present invention, since

the page number is adopted as the tag content, the page

position can be known in small size at a glance. Since the

numbers are common throughout the world nations, the

15   interface is consistent without regard to the language.

A sheet with tag for use in the spread sheet software

(e.g., Excel (trademark) manufactured by Microsoft) is one

of the interfaces in which the order of tags is not clearly

defined. For instance, if a sheet 1 is opened, the

arrangement of sheets is drawn in the order of the sheet

1 indicated by reference numeral 311, a sheet 2 indicated

by reference numeral 312, and a sheet 3 indicated by

reference numeral 313, as shown in FIG. 67A. However, if

5   the sheet 2 is opened, it is possible to construe the

arrangement of sheets in the order of sheet 2, sheet 1,

and sheet 3 (or the order of sheet 2, sheet 3 and sheet

1), supposing that the physical sheets of paper are stacked,

as shown in FIG. 67B. Only for the reason that the sheets

10   are arranged in the order from the right, there is no

gainsaying that the order of sheets is not changed, because

it is unnatural visually. Some user layers may feel the

interface to lack consistency and be irksome.

The conventional tag does not present a linear

15   information structure (information structure having

visually fixed order of sheet 1, sheet 2 and sheet 3 in

this example) in accordance with the order of pages such

as a book. Therefore, the user may be visually confused

with respect to the order of electronic information. It

is troublesome, particularly for the purposes of easily

gaining access to the information, that the recognition

of such information structure may sometimes confuse the

user.

5   On the other hand, due to the arrangement of tags in

this example, the user can understand a linear structure

of page information from the state of overlapped tags in

both the normal and the semantic display. After turning

the page, the height or ratio of tag is consistently

10   maintained. Accordingly, this interface may become

attached to many users.

The present invention is configured and functions as

described above and can provide a page information display

method superior to the conventional display method in that

15   when a dragging is made in a direction parallel or

anti-parallel to the page turning direction, an operation

of turning one page is effected in accordance with the

dragging direction, and the pages of electronic

information can be turned with the same operation as the

movement of a user's hand when the actual pages of paper

are turned, whereby the user unfamiliar with the computer

can intuitively master the operations required to gain

access to the electronic information, and the readers of

5   the electronic information can be extended over the wide

classes of society beyond the computer users.

The invention may be embodied in other specific forms

without departing from the spirit or essential

10   characteristic thereof. The present embodiments are

therefore to be considered in all respects as illustrative

and not restrictive, the scope of the invention being

indicated by the appended claims rather than by the

foregoing description and all changes which come within

15   the meaning and range of equivalency of the claims are

therefore intended to be embraced therein.

The entire disclosure of Japanese Patent Application

No. 2000-078220 (Filed on March 21st, 2000) including

specification, claims, drawings and summary are

incorporated herein by reference in its entirety.